

US EPA RECORDS CENTER REGION 5



442816

9/1/93  
Former Materials  
Service Yard 18  
LPC 0311715101  
ILN000510247  
Cook Co.  
SF/HRS

# CERCLA Preliminary Assessment



Illinois Environmental  
Protection Agency

CERCLA Preliminary Assessment

For:

Former Materials Service Yard 18  
(Quarry Reclamation District TIF #4)  
Cook County, Lyons, IL  
ILN# 000510247 / LPC 0311715101

PREPARED BY:  
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
BUREAU OF LAND  
DIVISION OF REMEDIATION MANAGEMENT  
OFFICE OF SITE EVALUATION

September 2008

**PRELIMINARY ASSESSMENT**  
**Quarry Reclamation District TIF #4**

**TABLE OF CONTENTS**

<b><u>SECTION</u></b>	<b><u>PAGE</u></b>
<b>Section 1.0 Introduction.....</b>	<b>4</b>
<b>Section 2.0 Site Background</b>	
Section 2.1 Site Description.....	5
Section 2.2 Site History.....	7
Section 2.3 Regulatory Status.....	10
<b>Section 3.0 Field Inspection Activities</b>	
Section 3.1 Past Environmental Investigations.....	10
Section 3.2 Field Inspection.....	11
Section 3.3 Analytical Data.....	12
<b>Section 4.0 Potential Sources</b>	
Section 4.1 Landfill.....	13
<b>Section 5.0 Pathway Discussions</b>	
Section 5.1 Groundwater.....	13
Section 5.2 Surface Water.....	14
Section 5.3 Soil Exposure.....	16
Section 5.4 Air.....	16
<b>Section 6.0 Summary.....</b>	<b>17</b>
<b>Section 7.0 References.....</b>	<b>19</b>
<b>Section 8.0 Figures and Tables</b>	
Figure 1.....	Site Location Map
Figure 2.....	Site Area Topographical Map
Figure 3.....	15 Mile Surface Water Map
Figure 4.....	XRF Screening Locations
Figure 5.....	Aerial Photograph (Quarry Area)
Table 1.....	Smith Park (XRF Results)
Table 2.....	Cook County Forest Preserve (XRF Results)
Table 3.....	Residential Area (XRF Results)
Table 4.....	Address Log

**APPENDICES**

Appendix A.....Exhibit D (Legal Description of Property)  
Appendix B.....Summary of Previous Soil Gas and Soil Flux Surveys

## **Section 1.0 Introduction**

On October 24 2007, the Region 5 Offices of the United States Environmental Protection Agency's (U.S. EPA) received a written petition to conduct a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Preliminary Assessment of the Former Materials Service Corporation Yard 18 (Quarry Reclamation District TIF # 4). The property in question is an approximately 13 acre parcel of commercial property located in the Village of Lyons, Illinois.

The request to conduct a CERCLA Preliminary Assessment (PA) was fostered by local residents' concerns that past filling activities of the quarry may have resulted in contamination which may have adversely impacted public health and/or the environment. Because the Illinois Environmental Protection Agency (Illinois EPA) is under Cooperative Agreement with the U.S. EPA to conduct all CERCLA investigations within the State of Illinois, the Illinois EPA was tasked to undertake this assessment.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300) requires that a Preliminary Assessment be performed on all sites entered into the Comprehensive Environmental Response, Compensation, Liability, and Information System (CERCLIS), the U.S. EPA's inventory of hazardous waste sites.

A Preliminary Assessment is the initial step in the Superfund process which utilizes a limited-scope investigation and collects readily available information. The Preliminary Assessment is designed to distinguish between sites that pose little or no threat to human health and the environment and those that require further investigation. The Preliminary Assessment also supports emergency response and removal activities,

fulfills public information needs, and generally furnishes appropriate information about the site early in the CERCLA assessment process.

If the findings of the Preliminary Assessment determine that further investigation is necessary, the site will continue to progress through the Superfund investigative process and receive a CERCLA Site Inspection. A Site Inspection will evaluate the extent that a site presents a threat to human health and/or the environment. This may be accomplished by collecting and analyzing wastes and environmental media samples to determine whether hazardous substances are present at the site and are migrating to the surrounding environment. The Site Inspection will provide necessary information that will determine if the site qualifies for possible inclusion on the National Priorities List (NPL) or should have No Further Remedial Action Planned (NFRAP).

At any time throughout the Superfund evaluation process, the site may be NFRAP, be referred to another state or federal clean-up program, or be recommended for further action. The Preliminary Assessment is performed under the authority of CERCLA.

## **Section 2.0 Site Background**

### **Section 2.1 Site Description**

The site is currently owned by the Village of Lyons, Cook County Illinois and is approximately 13 acres in size. The site is located at 4152 Lawndale Avenue, and is bordered to the north by Ogden Avenue, to the east by Lawndale Avenue. The site is bordered to the south by commercial buildings, a residential area, and to the west by the State Route 171. Moving further away from the site is a Cook County Forest Preserve to

the north, Smith Park to the east, a residential area to the south, and a mixture of commercial/light industrial properties to the west. The site is located in Northeast Quarter of Section 2, Township 38 North, and Range 12 East of the Third Principal Meridian. This property is located in a suburban area of Cook County, approximately 12 miles southeast of downtown Chicago. The central point of the property is located at 41.8147° North latitude and 87.8269° West longitude.

The majority of the property is relatively flat with little local relief. The western edge of the site is sloped toward the active portion of the quarry operation. Surface water run-off from the site is directed to the north and ultimately is discharged into the Des Plaines River. Groundwater from the Active Quarry is collected a pit at the lowest point of the quarry. Pumps are used to move the groundwater to the surface where it is combined with the surface water discharge and ultimately discharged into the Des Plaines River.

An interview with the current environmental consultant for the owner indicated that the Village of Lyons has owned the property since December of 2006. Since that time the village has enrolled portions of the site in the Illinois EPA's Site Remediation Program (SRP). Currently, the 13 acre area evaluated by this PA is an active SRP site. To date one area on the very northern side of the site has received a No Further Remediation (NFR) letter from the Illinois EPA. This area was a former service station. (See Figure 5)

The general development plan as relayed by the consultant to the author of this report is to develop the area enrolled in the SRP into a recreational area for the village. The current recreational area referred to as Smith Park will then be developed into residential property.

A site reconnaissance of the property was conducted by staff of the Illinois EPA on April 3, 2008. The focus of the site visit was Smith Park, the Cook County Forest Preserve and the residential area immediately around the site. The site itself appeared to be a typical construction site with a mix of vegetated areas and small stands of trees around the perimeter. Smith Park was well maintained and appeared to be an active area for the surrounding community. The forest preserve was also well kept and was configured for sporting events. The residential area was primarily comprised of single family homes that appeared to be actively maintained and in good condition. There were no schools or day care facilities noted immediately around the site.

## **Section 2.2 Site History**

The site originally was owned and developed by Materials Service Corporation (MSC), which was founded in 1919, by the Crown brothers of Chicago, Illinois. Based on file information this area was undeveloped until 1901. The area commonly referred to as the "Former Quarry" is first noted on a 1925, United States Geological Survey (USGS) topographical map. This map indicates that the former quarry was 80 feet below ground surface (bgs) at that time. By the 1930's, the site consisted of three main areas: 1) Former Quarry, located in the central and western portions of the site; which contains several structures located in the northeastern portion of the site; 2) Corner of Route 34 (Ogden Avenue) and Lawndale Avenue; and 3) MSC buildings in the southeastern portion of the site. The Former Quarry, Corner of Ogden and Lawndale Avenues and MSC Buildings will be discussed in more detail later in this section. In December 2006, the Village of Lyons acquired the site.

On October 24, 2007 the Region 5 Offices of the U.S. EPA received a written petition to conduct a CERCLA Preliminary Assessment of the Former Materials Services Corporation Yard 18. On April 3, 2008 representatives of the Illinois EPA traveled to Smith Park and met with a representative for the petitioners. This was an informal meeting in which the CERCLA process was outlined as well as program objectives. The community representative also provided additional information about the residential area. On April 3, 2008 the Illinois EPA also started a limited field investigation of Smith Park, the forest preserve and the adjacent residential area. This investigation was undertaken due to the petitioners concerns of the potential release of contaminants to the air from the site. The results of this investigation will be presented in the Air Pathway Section.

### **Former Quarry**

From at least 1939 to 1953, the central and western portions of the site consisted of the "Former Quarry" and the "Active Quarry". By 1962, the Former Quarry was filled in, with the exception of the far western portion of the site that was graded down toward the Existing Quarry. There is no specific information regarding the material that was used to fill the Former Quarry. According to Illinois EPA file information this area was also designated as a Clean Construction Demolition Debris (CCDD) area.

From the early 1980's to 1995, an asphalt company was operated on the western portion of the site and within the Former Quarry area. In 1993, a leak in an underground diesel supply line in the Former Quarry was detected and reported to the Illinois Emergency Management Agency (IEMA) and assigned Incident Number 931154. An investigation of the underground diesel leak found that it had migrated west to the Active

Quarry. A clean-up was conducted in both areas by the asphalt company. The Illinois EPA never issued a No Further Remediation (NFR) letter for either area. It also appears that two underground storage tanks (UST) were removed from the Former Quarry in 1995, with oversight from the Office of the State Fire Marshall (OSFM). The Former Quarry then became a staging area for CCDD.

From 1980 to 2006, there was a pond (Former Pond) located along the eastern edge of the quarry. This served as a holding area for surface water and groundwater that infiltrated the Active Quarry. Ultimately this water was discharged into the Des Plaines River. The pond has been filled in, leveled and incorporated into the developmental plan for the site.

#### **Corner of Ogden and Lawndale Avenues**

In 1939, this area was occupied by a residential building. From 1951 to 1980, it appears that a service station was located in this area. According to the OSFM, five gasoline tanks were removed from the area in 1995. During the tank removal, a release of gasoline was documented (IEMA Incident Number 971705). At the conclusion of this process an NFR letter was issued by the Illinois EPA in 2006, for the area in question.

#### **Material Services Corporation (MSC) Buildings**

Dating back to 1930, several structures and railroad spurs owned and operated by MSC have occupied the southeast area of the site. From 1951 to at least 1975, there was an office and warehouse building located along Lawndale Avenue. By 1988, the railroad spurs had been removed. The warehouse building no longer exists, along Lawndale

Avenue and a portion of the office building had been removed to facilitate future development of a community center.

### **Section 2.3 Regulatory Status**

A review of existing records suggests that the property in question is not subject to the Resource Conservation and Recovery Act (RCRA) corrective action authority. Information currently available does not indicate that the site is under the authority of the Atomic Energy Act (AEA), Uranium Mine Tailings Action (UMTRCA), or the Federal Insecticide Fungicide or Rodenticide Act (FIFRA). The site is currently enrolled in the Illinois EPA Site Remediation Program and has received one NFR letter for a 0.37 acre portion of the site.

## **Section 3.0 Field Inspection Activities**

### **Section 3.1 Past Environmental Investigations**

Several different multi-phased environmental investigations have been conducted at the site with the intent to meet the requirements of several different regulatory environmental programs. This section summarizes the information from investigations that characterizes the materials used as fill at the site or documents a release of hazardous materials.

In 1993, Alpha Environmental, Incorporated conducted a site investigation and provided remedial oversight for a release of diesel fuel. The release occurred at the asphalt plant located at the Former Quarry. Soil samples collected at the time of the release revealed elevated levels of: benzene, toluene, ethylbenzene, and xylene. The areas

in question were remediated but this area has never received an NFR letter for the Illinois EPA.

In 2007, Bradburne, Briller, and Johnson, LLC (BB&J), an environmental consultant for the Village of Lyons, submitted a Comprehensive Site Investigation Report (CSIR) to the Illinois EPA. This report contains sample results for: soil, groundwater, and soil gas. The soil sample results indicated the presence of: volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), and metals. These samples were collected at a depth of three and a half feet to sixty feet. The groundwater results indicated the presence of SVOCs and metals. The monitoring wells ranged in depth of 90 to 99 feet. The soil gas samples were only analyzed for VOCs, and the results indicated the presence of 28 different VOCs including carbon.

### **Section 3.2 Field Inspections**

In response to the written petition filed in October of 2007, the Illinois EPA conducted a site reconnaissance of the property and surrounding area in April of 2008. During the site visit it was observed, that the site was the location of many on-going construction projects.

On April 3, 2008, staff of the Illinois EPA traveled to three areas mentioned in the petition as being potentially adversely affected by past activities at the site. These areas included: Smith Park, a Cook County forest preserve, and the residential area adjacent to the site. The purpose of the visit was to perform multiple X-ray fluorescence (XRF) measurements of surface soils at the properties identified above. The XRF is a field based instrument used to detect and measure inorganic elements in soil. This activity was in

response to the petitioners concerns of a potential release of contaminants to the air from the site.

### **Section 3.3 Analytical Data**

On April 3 2008, the Illinois EPA collected XRF readings at Smith Park and the Cook County Forest Preserve in the presence of a representative for the Village of Lyons. The Illinois EPA field team performed approximately 41 XRF readings at Smith Park. The XRF results for Smith Park can be found in Table 1, of this report. The Illinois EPA field team then moved to the forest preserve and collected XRF data at an additional 11 locations. The XRF results for the forest preserve can be found in Table 2, of this report. The representative of the village left the area and the field team moved to the residential area and collected XRF data at an additional 26 locations. The XRF results for the residential area can be found in Table 3, of this report. The addresses for the residential area are located in Table 4, of this report. These results were also forwarded to the Illinois Department of Public Health (IDPH) for interpretation. IDPH, has sent letters to each home owner explaining their individual results from the investigation. Only one of the readings taken exceeded a health based bench mark. The soil in this area did not appear to be native and it is believed that the elevated levels are not due to site activities.

In summary, a total of approximately 81 XRF readings collected from the three areas identified by the PA Petition. All of the readings were collected from the surface soils from an area just below the “sod” layer, at a depth of approximately zero to one inch.

## **Section 4.0 Known Sources**

### **Section 4.1 Landfill**

The materials used to fill the Former Quarry are a potential source of contamination for the 13 acre site. Quarry operations began at this location in 1919. File information indicates that the quarry was excavated to approximately 80 feet bgs. By 1962 this area was filled and graded down toward the Active Quarry. There are no records of the type and quantity of the materials disposed of at the site but soil borings in the Former Quarry have occasionally encountered traces of sand and gravel, ash, asphalt, wood, and brick debris. These soil borings ranged in depth from five to 55 feet. Past analytical data has document the presence of metals, VOCs, and SVOCs in the potential source area.

## **Section 5.0 Pathway Discussions**

### **Section 5.1 Groundwater**

The site is located near the intersection of Ogden Avenue and Lawndale Avenue. Geology of the area consists of glacial sediments in the vicinity of the site which are relatively thin dense silty-clay tills of the Wadsworth Member of the Wedron Till. This till unit is made up of dense unstratified silty-clay sediments with shale and limestone fragments that make up the majority of the unconsolidated sediments in this general area.

Bedrock in the area unconformably underlies the unconsolidated glacial material and consisits of Silurian-age Niagaran dolomite. This dense micritic dolomitic limestone was formed by inland seas and was originally solution and reefal type limestone deposits. The original vuggy pore space remains in former reefal areas and solution and dissolution

fractures are present predominantly in the upper 50 feet. Underlying the Niagaran dolomite is an Ordovician-age shale and dolomite unit called the Maquoketa Group.

The Village of Lyons like many other communities surrounding Chicago utilizes drinking water from Lake Michigan through the City of Chicago's drinking water system. There are no community water supply wells or private drinking water wells within four miles of the site. The Illinois EPA been informed of one private well located near Smith Park, but after repeated requests for additional information, the Illinois EPA has been unable to verify that the well exists. Finally, the village has a groundwater ordinance that prohibits the use of groundwater for drinking water purposes inside the village limits.

Groundwater samples from the 2007, Bradburne, Briller and Johnson, LLC (BB&J) Comprehensive Site Investigation Report (CSIR) have documented a release of lead to the groundwater. The results were above the Class 1, remedial objectives for the groundwater component of the groundwater ingestion route. Although groundwater is not used as a source of drinking water, the Active Quarry collects the groundwater that infiltrates the quarry and then discharges it directly to the Des Plaines River. Groundwater discharged into the Des Plaines River has the potential to impact surface water conditions. This will be discussed later in this report.

## **Section 5.2 Surface Water**

This pathway begins where surface water run-off from the site enters the first perennial water body. This point is referred to as the probable point of entry (PPE). This pathway then travels fifteen miles downstream completing the 15-Mile Target Distance

Limit (TDL). (See Figure 3). For this site there are two different PPEs and they will be referred to the Historic PPE and the Active PPE.

Historically, surface water and groundwater that infiltrated the Active Quarry was pumped and held in the Former Pond located on the Former Quarry. From the Former Pond it was directed north and into the Des Plaines River. The point where the drainage from the site enters the Des Plaines River is the Historic PPE. It appears that this was the drainage route until 2006, when the Former Pond was fill in and leveled.

Currently, surface water and groundwater that infiltrate the Active Quarry is pumped and then discharged in a storm sewer along Ogden Avenue. This storm sewer runs east along Ogden Avenue and then discharges into the Des Plaines River. The point where the storm sewer discharges into the Des Plaines River is the Active PPE. This is a permitted discharge through the National Pollutant Discharge Elimination System (NPDES).

From the PPE the surface water pathway travels along the Des Plaines River approximately 12.6 miles to the confluence with the Calumet Sag Channel. From the confluence the surface water pathway continues an additional 2.4 miles along the Des Plaines River. The 15 mile Target Distance Limit terminates near Lemont, Illinois.

The first emergent wetlands along the 15 mile Target Distance Limit are approximately 800 feet down stream of the site. The next emergent wetlands are approximately 4.75 miles down stream of the site. There are also two different forest preserves along the Des Plaines River and they are within the 15 mile Target Distance Limit. The Des Plaines River is considered a fishery by the Illinois Department of Natural Resources.

### **Section 5.3 Soil Exposure**

The site is a 13 acre parcel of land located at 4152 Lawndale Avenue, and is bordered to the north by Ogden Avenue, to the east by Lawndale Avenue, to the south by commercial buildings and a residential area and to the west by the State Route 171. There are two schools located within one mile of the site. The April, 2008 site reconnaissance found the site to be a typical commercial construction site. The surface of the site was a mix of vegetated and non-vegetated areas.

The Village of Lyons has a redevelopment plan for this parcel that includes open space for recreational uses, community center, and parking areas. As mentioned earlier in this report, the village has been working with the Illinois EPA's SRP to obtain a comprehensive NFR letter for the site.

A total of 14 soil gas samples were collected from the site and one from Smith Park. A summary of these results can be found in Appendix B. Carbon Disulfide was detected at the site and at Smith Park. Smith Park is adjacent to the site on the east and intended to be developed into a multi-family residential area in the future. Smith Park is currently bordered on three sides by single-family residential properties. These residential properties have the potential to have Carbon Disulfide or other VOCs migrating into the enclosed areas of basements or crawl spaces. VOCs can continually migrate into enclosed spaces and their concentrations may increase over time.

### **Section 5.4 Air Pathway**

No formal air samples have been collected during any of the environmental investigations mentioned in this report. Informal citizen complaints regarding dust from past and present site activities prompted the Illinois EPA in April of 2008 to collect

multiple XRF readings. Multiple surface XRF readings were taken from three areas identified in the PA Petition as being adversely affected by past activities at the site. With one exception all of the XRF readings taken by the Illinois EPA, were below their respective health based bench marks. Detailed information regarding this event was presented in the Field Inspection Activities Section. Based on the results of these readings the Air Pathway is not of concern at this time.

### **Section 6.0 Summary**

The Illinois EPA's Office of Site Evaluation was tasked to evaluate the Former Materials Service Yard 18 property to determine its current and potential impact on the surrounding human populations, area groundwater, and nearby surface waters. The evaluation utilized existing data and research on the Former Materials Service Yard 18 property. Additional XRF readings were collected to enhance the existing data.

The site is a 13 acre parcel of land located at 4152 Lawndale Avenue, Lyons Illinois. This area originated as a quarry and was later filled with a variety of unknown materials. There is currently an active quarry bordering the site to the west and a densely populated residential area to the east and south of the site. There are also two recreational areas contiguous to the site. As part of a redevelopment plan for this area the village has enrolled the site in the Illinois SRP.

Soil gas information obtained to fulfill the requirements of the SRP has shown a possible link between contamination at the site and Smith Park. These levels do not exceed any health based exposure standard. Throughout the operational history of the site, groundwater and surface water that infiltrates the quarry has been discharged

directly north and into the Des Plaines River. Recent sampling of this effluent does not indicate that any hazardous materials have been discharged into the Des Plains River.

No formal air samples have been collected as part of any past environmental investigations. Multiple surface XRF readings were collected from the residential and recreational areas around the site to determine if air blown dust from the site contained heavy metals. Base on these readings the Air Pathway is not a concern at this time.

The Groundwater Pathway is also not a concern at this site because groundwater is not utilized as a source of drinking water and the village has a groundwater ordinance that forbids the installation of any drinking water wells within the village limits.

## **Section 7.0 References**

Bradburn, Briller and Johnson, LLC. "Comprehensive Site Investigation Report, Village of Lyons / Quarry Reclamation District TIF #4". October 31, 2007.

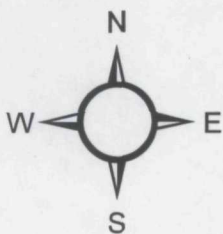
Illinois Environmental Protection Agency. Bureau of Land. File Information.

Illinois Natural Resources Geospatial Data Clearinghouse. Aerial Photography and Orthophotography. 2005 CUA Data, UTM.

Illinois Natural Resources Geospatial Data Clearinghouse. Digital Topographic Maps.

Parker, Antonie and Jonak, Robert. "Preliminary Assesment Petition". 2007.

Former Materials Service  
Corporation Yard 18



**Figure 1**  
**Site Location Map**  
**Former Materials Service Corporation Yard 18**  
**ILN 000510247 LPC 0311715101**



FIGURE 2  
SITE TOPOGRAPHIC MAP  
FORMER MATERIALS SERVICE CORPORATION  
YARD 18  
ILN 000510247 / LPC 0311715101

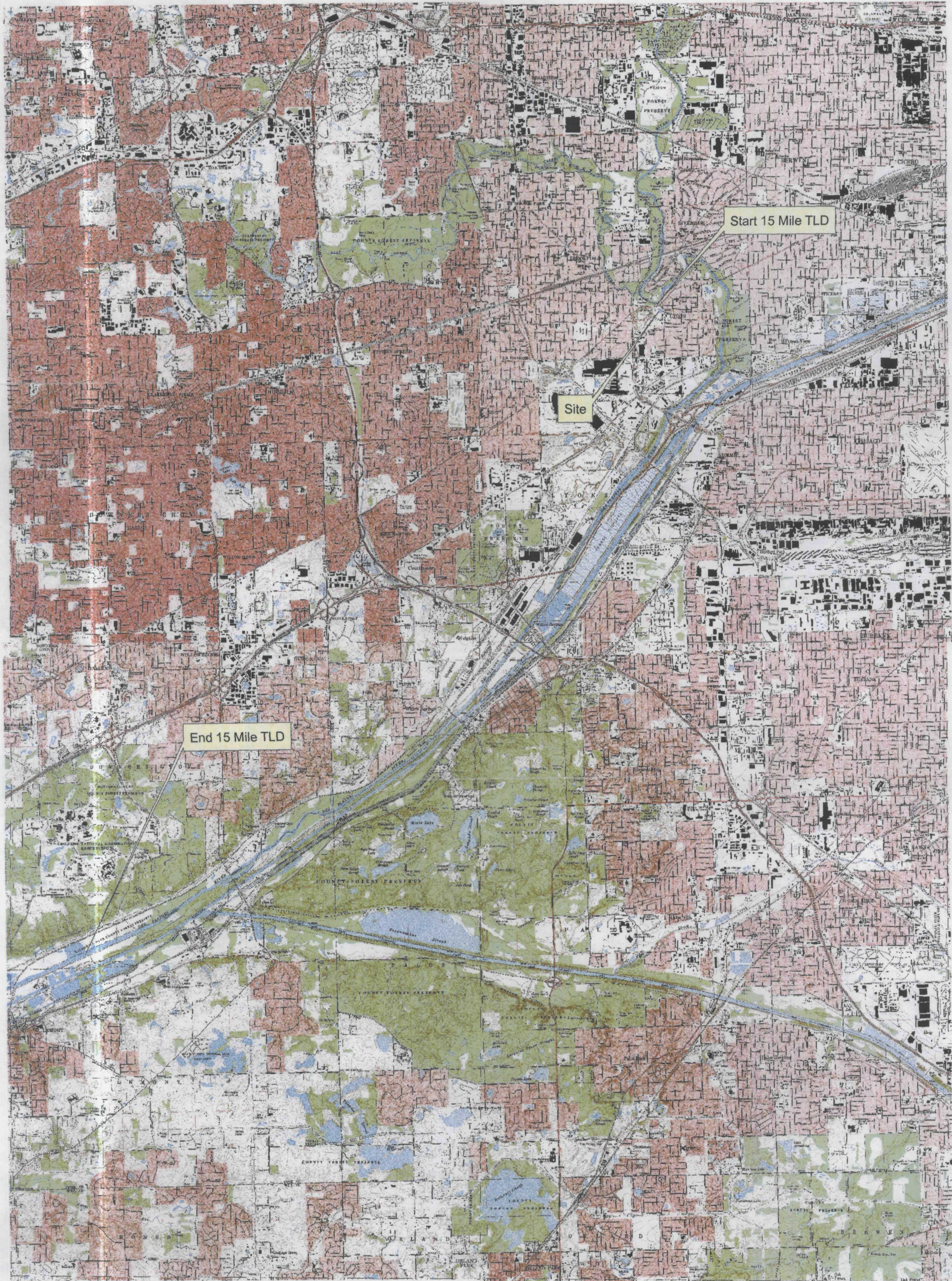
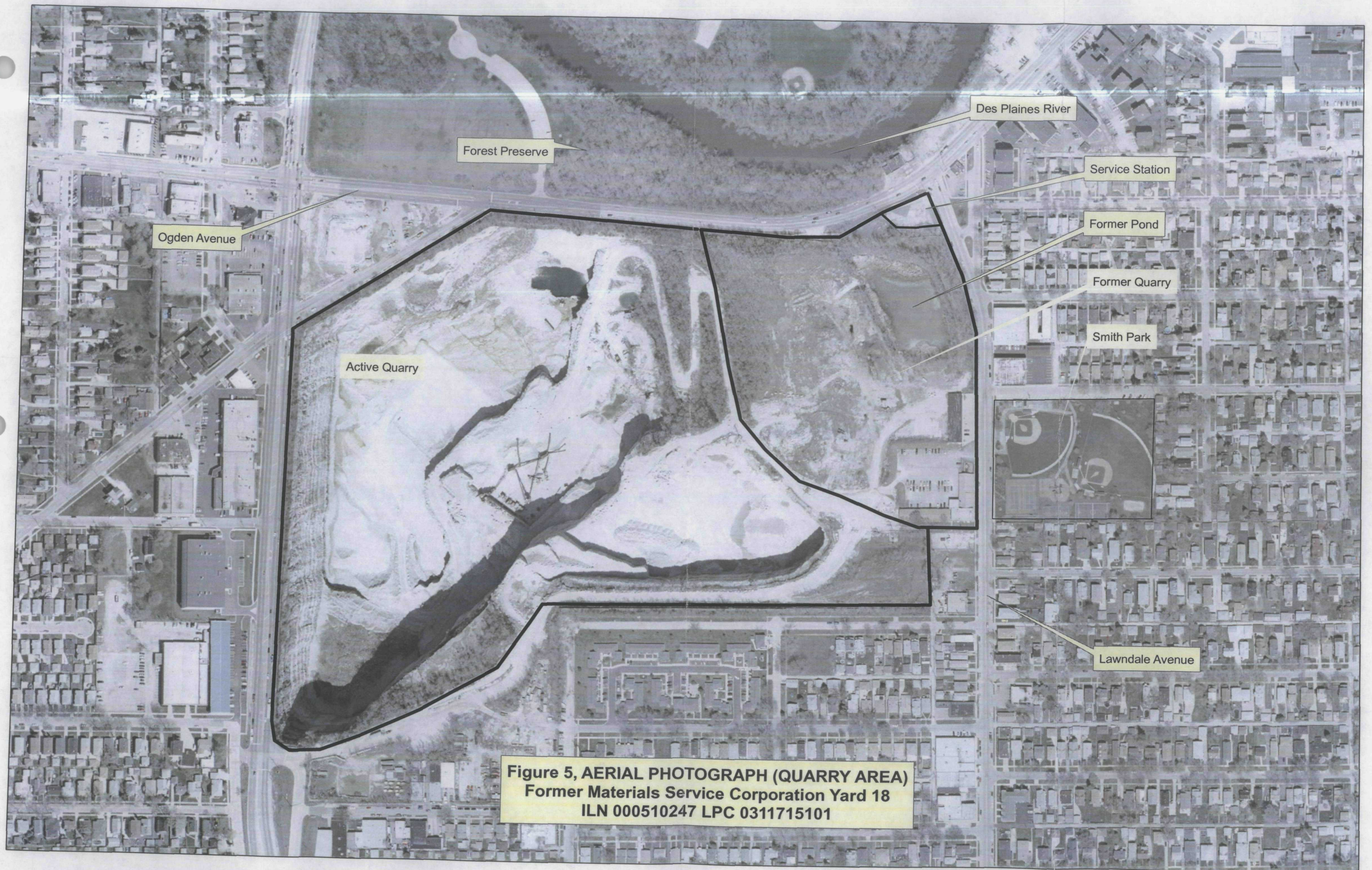


FIGURE 3  
15 MILE SURFACE WATER MAP  
FORMER MATERIAL SERVICE CORPORATION  
YARD 18  
ILN 000510247 / LPC 0311715101



**FIGURE 4, XRF SCREENING LOCATIONS  
FORMER MATERIALS SERVICE YARD 18  
ILN 000510247 LPC 0311715101**



**Figure 5, AERIAL PHOTOGRAPH (QUARRY AREA)**  
**Former Materials Service Corporation Yard 18**  
**ILN 000510247 LPC 0311715101**

**TABLE 1, SMITH PARK**  
**XRF Screening Results**  
**FORMER MATERIALS SERVICE CORPORATION YARD 18**  
**ILN 000510247 / LPC 0311715101**

Reading #	Mo	Zr	Sr	Rb	Pb	Se	As	Hg	Zn	Cu	Ni	Co	Fe	Mn	Cr
Lyons, Illinois 4/08															
Along Lawndale Avenue															
4	<LOD	13.4	<LOD	<LOD	70.5	<LOD	<LOD	<LOD	167.7	<LOD	<LOD	<LOD	6208	<LOD	<LOD
5	<LOD	66.2	<LOD	39	42.2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8729.6	<LOD	<LOD
6	<LOD	79.6	<LOD	29.6	49.3	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	9676.8	<LOD	<LOD
7	<LOD	69.6	<LOD	52.1	103.3	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	10694.4	<LOD	<LOD
8	<LOD	78.8	<LOD	43.1	289.4	<LOD	<LOD	<LOD	162.1	<LOD	<LOD	<LOD	10694.4	<LOD	<LOD
9	<LOD	57.3	<LOD	59.5	79.9	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	10598.4	<LOD	<LOD
Around Tennis Courts															
10	<LOD	85	<LOD	54.6	168.5	<LOD	<LOD	<LOD	108.8	<LOD	<LOD	<LOD	10899.2	<LOD	<LOD
11	<LOD	44	<LOD	35.4	240	<LOD	<LOD	<LOD	129.7	<LOD	<LOD	<LOD	8064	<LOD	<LOD
12	<LOD	77.7	<LOD	52.3	462.4	<LOD	<LOD	<LOD	201.2	<LOD	<LOD	<LOD	11200	<LOD	<LOD
13	<LOD	65	<LOD	48.5	226.4	<LOD	<LOD	<LOD	225.2	<LOD	<LOD	<LOD	11398.4	<LOD	<LOD
14	<LOD	84.6	<LOD	43.5	173	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8684.8	<LOD	<LOD
15	<LOD	36.1	<LOD	25.5	601.2	<LOD	<LOD	<LOD	306.4	<LOD	<LOD	<LOD	7168	<LOD	<LOD
16	<LOD	57.5	<LOD	27.1	349.4	<LOD	<LOD	<LOD	201.7	<LOD	<LOD	<LOD	8166.4	<LOD	<LOD
17	<LOD	55.2	<LOD	32.9	258	<LOD	<LOD	<LOD	103.8	<LOD	<LOD	<LOD	9209.6	<LOD	<LOD
18	<LOD	63	<LOD	<LOD	175.8	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8307.2	<LOD	<LOD
19	<LOD	67.9	<LOD	37.8	410.8	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	10598.4	<LOD	<LOD
20	<LOD	65.9	<LOD	48.9	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8339.2	<LOD	<LOD
21	<LOD	68.8	<LOD	36	75	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8569.6	<LOD	<LOD
22	<LOD	47.1	<LOD	27	154.1	<LOD	<LOD	<LOD	147.4	<LOD	<LOD	<LOD	8096	<LOD	<LOD
23	<LOD	53.5	<LOD	23.8	101.3	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	6358.4	<LOD	<LOD
Fenced Area (west of tennis courts)															
24	<LOD	81.4	<LOD	29.4	89.5	<LOD	<LOD	<LOD	89.4	<LOD	<LOD	<LOD	8480	<LOD	<LOD
25	<LOD	65.9	<LOD	19.7	143.4	<LOD	<LOD	<LOD	177.1	<LOD	<LOD	<LOD	7616	<LOD	<LOD
26	<LOD	55.9	<LOD	40	157.3	<LOD	<LOD	<LOD	175.7	<LOD	<LOD	<LOD	7795.2	<LOD	<LOD
27	<LOD	74.3	<LOD	23.5	138.7	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	9945.6	<LOD	<LOD
28	<LOD	22.6	<LOD	18.2	59.4	<LOD	<LOD	<LOD	449.2	<LOD	<LOD	<LOD	5408	<LOD	<LOD
29	<LOD	67.1	<LOD	42	402	<LOD	<LOD	<LOD	201.2	<LOD	<LOD	<LOD	8556.8	<LOD	<LOD
30	<LOD	79.5	<LOD	45.9	134.6	<LOD	<LOD	<LOD	98.2	<LOD	<LOD	<LOD	11398.4	<LOD	<LOD
31	<LOD	95.1	<LOD	49.4	349.4	<LOD	<LOD	<LOD	936	<LOD	<LOD	<LOD	10694.4	<LOD	<LOD
32	<LOD	79.8	<LOD	37.6	178.7	<LOD	<LOD	<LOD	177	<LOD	<LOD	<LOD	10496	<LOD	<LOD
Park Area															
33	<LOD	68.8	<LOD	38.6	91.9	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8896	<LOD	<LOD
34	<LOD	68.7	<LOD	24.2	59	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	7859.2	<LOD	<LOD
35	<LOD	65.7	<LOD	30.1	36.4	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	6508.8	<LOD	<LOD
36	<LOD	83.4	<LOD	43	89.5	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	10099.2	<LOD	<LOD
37	<LOD	73.5	<LOD	52.2	43.4	<LOD	<LOD	<LOD	91.6	<LOD	<LOD	<LOD	8185.6	<LOD	<LOD
38	<LOD	68.4	<LOD	51.7	52.6	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8524.8	<LOD	<LOD
39	<LOD	75.4	<LOD	31.2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8256	<LOD	<LOD
40	<LOD	68.6	<LOD	37.6	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8684.8	<LOD	<LOD
41	<LOD	87.7	<LOD	48.7	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	9856	<LOD	<LOD
42	<LOD	93.1	<LOD	46.7	115.5	<LOD	<LOD	<LOD	121	<LOD	<LOD	<LOD	9376	<LOD	<LOD
43	<LOD	70.3	<LOD	43.3	268.8	<LOD	<LOD	<LOD	134.1	<LOD	<LOD	<LOD	9715.2	<LOD	<LOD
44	<LOD	75.1	<LOD	41.3	103.2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	9644.8	<LOD	<LOD
45	<LOD	84.7	<LOD	61	105.6	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	10496	<LOD	<LOD

**TABLE 2, COOK COUNTY FOREST PRESERVE****XRF Screening Results****FORMER MATERIALS SERVICE YARD 18**

ILN 000510247 / LPC 0311715101

Lyons Illinois (4/08)

Reading #	Mo	Zr	Sr	Rb	Pb	Se	As	Hg	Zn	Cu	Ni	Co	Fe	Mn	Cr
46	<LOD	86.3	<LOD	43.6	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	9376	<LOD	<LOD
47	<LOD	88	<LOD	37.5	73.3	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	10400	<LOD	<LOD
48	<LOD	94	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	17689.6	<LOD	<LOD
49	<LOD	101.9	<LOD	67.7	100	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	12800	<LOD	<LOD
50	<LOD	71.4	<LOD	71.9	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	9945.6	<LOD	<LOD
51	<LOD	93.5	<LOD	55.1	70.8	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	13196.8	<LOD	<LOD
52	<LOD	86.1	<LOD	62.5	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	11398.4	<LOD	<LOD
53	<LOD	92	<LOD	37.6	60.1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	9625.6	<LOD	<LOD
54	<LOD	61	<LOD	37.5	34.8	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	7667.2	<LOD	<LOD
55	<LOD	75.6	<LOD	51.4	<LOD	<LOD	<LOD	<LOD	85.6	<LOD	<LOD	<LOD	10694.4	<LOD	<LOD
56	<LOD	90.1	<LOD	52.7	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	12396.8	<LOD	<LOD

**TABLE 3, RESIDENTIAL AREA**  
**XRF Screening Results**  
**FORMER MATERIALS SERVICE CORPORATION YARD 18**  
**ILN 000510247 / LPC 0311715101**  
 Lyons, Illinois 4/08

Reading #	Mo	Zr	Sr	Rb	Pb	Se	As	Hg	Zn	Cu	Ni	Co	Fe	Mn	Cr
57	<LOD	66.2	<LOD	30.8	260.8	<LOD	<LOD	<LOD	221.2	<LOD	<LOD	<LOD	12697.6	<LOD	<LOD
58	<LOD	68.2	<LOD	44.8	267.4	<LOD	<LOD	<LOD	262.6	<LOD	<LOD	<LOD	13696	<LOD	<LOD
59	<LOD	72.4	<LOD	41	304.6	<LOD	<LOD	<LOD	437.2	<LOD	<LOD	<LOD	13593.6	<LOD	<LOD
60	<LOD	83	<LOD	29.4	234.4	<LOD	<LOD	<LOD	290.6	<LOD	<LOD	<LOD	11296	<LOD	<LOD
61	<LOD	86.7	<LOD	50.2	108.8	<LOD	<LOD	<LOD	193.1	<LOD	<LOD	<LOD	11296	<LOD	<LOD
62	<LOD	71.7	<LOD	32.5	226.6	<LOD	<LOD	<LOD	221.8	<LOD	<LOD	<LOD	12294.4	<LOD	<LOD
63	<LOD	137.7	<LOD	47.6	77.5	<LOD	<LOD	<LOD	135	<LOD	<LOD	<LOD	12896	<LOD	<LOD
64	<LOD	107.4	<LOD	30.6	696.4	<LOD	<LOD	<LOD	230.4	<LOD	<LOD	<LOD	13299.2	<LOD	<LOD
65	<LOD	92.3	<LOD	49.9	199.6	<LOD	<LOD	<LOD	167	<LOD	<LOD	<LOD	10496	<LOD	<LOD
66	<LOD	92.4	<LOD	56.1	71.8	<LOD	<LOD	<LOD	75.8	<LOD	<LOD	<LOD	12198.4	<LOD	<LOD
68	<LOD	81.4	<LOD	66.2	207	<LOD	<LOD	<LOD	242.2	<LOD	<LOD	<LOD	14694.4	<LOD	536.8
71	<LOD	79.5	<LOD	56.7	82.6	<LOD	<LOD	<LOD	125.2	<LOD	<LOD	<LOD	12998.4	<LOD	<LOD
72	<LOD	86.6	<LOD	36.5	88.2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	10995.2	<LOD	<LOD
73	<LOD	107.6	<LOD	37.5	210.8	<LOD	<LOD	<LOD	134.9	<LOD	<LOD	<LOD	11596.8	<LOD	<LOD
74	<LOD	46.6	<LOD	40.1	52.9	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8467.2	<LOD	<LOD
75	<LOD	62.3	<LOD	38	76.5	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	9216	<LOD	<LOD
76	<LOD	99.7	<LOD	47.8	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	12000	<LOD	<LOD
77	<LOD	80.5	<LOD	53.2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	11398.4	<LOD	<LOD
78	<LOD	86.2	<LOD	69.3	78.4	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	13696	<LOD	<LOD
79	<LOD	98.1	<LOD	56.4	150.8	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	11897.6	<LOD	<LOD
80	<LOD	70.2	<LOD	36.4	142.8	<LOD	<LOD	<LOD	143.2	<LOD	<LOD	<LOD	10099.2	<LOD	<LOD
81	<LOD	123.9	<LOD	46.7	214.8	<LOD	<LOD	<LOD	90.7	<LOD	<LOD	<LOD	10796.8	<LOD	<LOD
82	<LOD	386.4	<LOD	48	64.6	<LOD	<LOD	<LOD	131.2	<LOD	<LOD	<LOD	11897.6	<LOD	<LOD
83	<LOD	94.5	<LOD	36.8	138.9	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	12000	<LOD	<LOD
84	<LOD	82.2	<LOD	58.1	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	11596.8	<LOD	<LOD
85	<LOD	107.8	<LOD	80	219.4	<LOD	<LOD	<LOD	216.4	<LOD	<LOD	<LOD	15091.2	<LOD	<LOD

**TABLE 4, ADDRESS LOG**  
**FORMER MATERIAL SERVICE YARD 18**  
 ILN 000510247 / LPC 0311715101  
 Lyons, Illinois (4/08)

Reading #	Name	Address
76-78	James Koc	8318 44th Place
81, 82	Walter Bialas	8424 West 45th
73-75	Brandee Kreutz	8239 West 43rd Place
79, 80	Tina Melendez	8237 43rd Place
63-65	Nick (unknow)	4236 Leland
83-85	Gregory Schemenauer	4214 Leland
66, 68	Robert & Kathleen Drenth	8108 White Ave.
71, 72	Joseph Matiello	8123 White Ave.
57-59	Caroline Possero	4301 Lawndale
60-62	James Phillips	8136 Christie

## APPENDIX A

**EXHIBIT D**

That part of the Northeast Quarter of Section 2, Township 38 North, Range 12 East of the Third Principal Meridian, bounded and described as follows: Commencing at the intersection of the North line of 43<sup>rd</sup> Street (33 feet wide) and the West line of Lawndale Avenue (66 feet wide); Thence North 00° 05' 54" West along the West line of said Lawndale Avenue, 252.29 feet to the point of beginning; Thence continuing North 00° 05' 54" West along said Lawndale Avenue, 406.86 feet; Thence continuing North 18° 35' 03" West, along said Lawndale Avenue, 242.53 feet; Thence North 71° 24' 57" East, 21.00 feet; Thence North 18° 35' 03" West, 180.20 feet; Thence South 71° 24' 57" West, 21.00 feet to the Westerly line of said Lawndale Avenue; Thence North 18° 35' 03" West along said Westerly line, 63.44 feet to the Southwesterly line of Ogden Avenue; Thence South 55° 09' 56" West along said Southwesterly line of Ogden Avenue, 344.20 feet; Thence continuing North 84° 53' 04" West along the Southerly line of said Ogden Avenue, 432.54 feet; Thence South 07° 28' 23" East, 518.67 feet; Thence South 61° 39' 25" East, 395.43 feet; Thence North 89° 45' 30" East, 207.20 feet; Thence South 01° 22' 52" West, 9.54 feet; Thence North 89° 45' 30" East, 246.53 feet to the West line of said Lawndale Avenue and the point of beginning, in Cook County, Illinois.

## APPENDIX B

## **APPENDIX L**

### **SUMMARY OF PREVIOUS SOIL GAS AND FLUX CHAMBER SURVEYS**

Bradburne, Briller & Johnson, LLC (BB&J) has performed several soil gas and flux chamber surveys in conjunction with BB&J's previous investigations to assess the potential for subsurface constituents of concern (COCs) at the Subject Property in addition to providing data for a preliminary risk evaluation based upon the proposed uses of the Subject Property at the time of the respective investigations. It should be noted that the Illinois Environmental Protection Agency (IEPA) does not currently have regulations and guidance concerning soil gas sampling methodologies or remediation objectives for soil gas concentrations. Further, the proposed use of the Subject Property has evolved during the course of the previous investigations as proposed uses and the locations of those uses have been revised. Therefore, the conclusions and recommendations based upon the data acquired during these investigations are no longer useful to the degree to which the reports were originally prepared.

As summarized below, the following are the investigations completed by BB&J that contain information regarding soil gas and flux chamber surveys:

- *Report of Limited and Preliminary Soil Gas Investigation*, prepared by BB&J, for the Village of Lyons, dated February 23, 2007 (BB&J 2007 Preliminary Soil Gas Investigation) (Included within this Appendix);
- *Report of Phase II Environmental Site Assessment, Strategy and Sampling – Commercial Development*, prepared by BB&J, for the Village of Lyons, dated June 13, 2007 (BB&J Phase II ESA: Commercial Development) (See Appendix H);
- *Report of Phase II Environmental Site Assessment, Future Use Evaluation*, prepared by BB&J, for Village of Lyons, dated June 13, 2007 (BB&J Phase II ESA: Future Use) (See Appendix I); and,
- *Report of Phase II Environmental Site Assessment, Strategy and Sampling – Community Center*, prepared by BB&J, for the Village of Lyons, dated June 26, 2007 (BB&J Phase II ESA: Community Center) (See Appendix J).

## **1.0 SITE-SPECIFIC SAMPLING PLAN**

### **1.1 BB&J Investigations**

The sampling procedures utilized during BB&J's investigations were conducted in accordance with the scope of work outlined in BB&J's proposals PN6-0296, PN7-0109, PN7-0117, PN7-0136 and have been incorporated into the Site-Specific Sampling Plan. The information below provides a detailed description of BB&J's sampling activities with respect to soil gas and flux chamber surveys at the Subject Property.

#### **1.1.1 BB&J Preliminary Soil Gas Investigation**

The sampling procedures utilized during the BB&J Preliminary Soil Gas Investigation are summarized below. Detailed sampling procedures are documented in the BB&J Preliminary Soil Gas Investigation, which are included herein.

The BB&J Preliminary Soil Gas Investigation was conducted to determine the potential for subsurface COCs to be present associated with the historical filling operations focused primarily within the central and western portions of the Subject Property. Since the specific origin of the fill material used to fill the former quarry (Former Quarry) was unknown beyond the fill material consisting of clean construction and demolition debris (CCDD) material<sup>1</sup> (Former CCDD Fill Operation), BB&J conducted a preliminary soil gas investigation to determine the potential presence of COCs. The BB&J Preliminary Soil Gas Investigation included an evaluation of the potential COCs regarding a proposed residential development located throughout the central portion of the Subject Property, as well as a proposed municipal community center located along the south-central portion of the Subject Property.

The scope of work included the collection of a total of 15 soil gas samples collected from primarily throughout the central portion of Subject Property within the subsurface of the proposed residential town homes development and the proposed community center. The soil gas samples were collected at a depth of five feet bgs using direct-push technology (i.e., Geoprobe<sup>®</sup>). The soil gas samples were submitted to H&P Mobile GeoChemistry<sup>2</sup> (H&P Laboratory) for analysis of volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method TO-15 and methane by USEPA Method 8015B.

#### **1.1.2 BB&J Phase II ESA: Commercial Development**

The sampling procedures utilized during the BB&J Phase II ESA: Commercial Development are summarized below. Detailed sampling procedures are documented in the BB&J Phase II ESA: Commercial Development, which are included as Appendix H.

The BB&J Phase II ESA: Commercial Development was prepared to further address the COCs identified by BB&J within the BB&J Preliminary Soil Gas Investigation; however, this investigation was located primarily in the north portion of the Subject Property in the area of a proposed commercial development. More specifically, this investigation was conducted near the north edge of the Former Quarry / Former CCDD Fill Operation.

During this investigation, BB&J conducted a second limited soil gas survey from three locations within the proposed commercial buildings on the north portion of the Subject Property. The soil gas samples were collected at a depth of five feet bgs using direct-push technology (i.e., Geoprobe<sup>®</sup>). The soil gas samples were submitted to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015B.

#### **1.1.3 BB&J Phase II ESA: Future Use**

The sampling procedures utilized during the BB&J Phase II ESA: Future Use is summarized below. Detailed sampling procedures are documented in the BB&J Phase II ESA: Future Use, which are included as Appendix I.

The BB&J Phase II ESA: Future Use Evaluation was prepared to further address the COCs identified by BB&J within the BB&J Preliminary Soil Gas Investigation. During this investigation, BB&J collected three soil gas samples from the southeastern portion of the Subject

<sup>1</sup> CCDD fill can include one or all of the following; brick, rock, stone, reclaimed asphalt pavement, uncontaminated soil and/or concrete.

<sup>2</sup> H&P maintains National Environmental Laboratory Accreditation Program (NELAP) certification which is recognized in Illinois.

Property at the time of this investigation<sup>3</sup>. The soil gas samples were collected at a depth of five feet bgs using direct-push technology (i.e., Geoprobe®). The soil gas samples were submitted to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015B.

BB&J also conducted a Flux Chamber Survey to assess ground surface emission rates (or “flux”) of VOCs from the subsurface (soil) beneath the central portion of the Subject Property and provide data for a preliminary risk evaluation based on the proposed outdoor recreational use of the Subject Property in the central portion of the Subject Property. The basic approach of the flux chamber method was to use an enclosure or chamber to isolate a surface from the ambient air and potential collect compounds emanating from the subsurface. Potential compounds would either build-up over time in the static chamber headspace or, in the dynamic chamber method, clean sweep air is added to the chamber at a controlled rate. The effluent air from the chamber was collected at the ground surface and submitted to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015B.

#### **1.1.4 BB&J Phase II ESA: Community Center**

The sampling procedures utilized during the BB&J Phase II ESA: Community Center is summarized below. Detailed sampling procedures are documented in the BB&J Phase II ESA: Community Center, which are included as Appendix J.

The BB&J Phase II ESA: Community Center was prepared to evaluate management and construction considerations related to the redevelopment of the southeast portion of the Subject Property as a proposed community center. This portion of the Subject Property was not located within the Former Quarry / Former CCDD Fill Operation. The soil gas samples were collected at a depth of five feet bgs using direct-push technology (i.e., Geoprobe®). The soil gas samples were submitted for laboratory analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015B.

BB&J also conducted a Flux Chamber Survey to assess ground surface emission rates (or “flux”) of VOCs from the subsurface (soil) beneath the footprint of the proposed community center and provide data for a preliminary risk evaluation based on the proposed community center use of the Subject Property. The basic approach of the flux chamber method was to use an enclosure or chamber to isolate a surface from the ambient air and potential collect compounds emanating from the subsurface. Potential compounds would either build-up over time in the static chamber headspace or, in the dynamic chamber method, clean sweep air is added to the chamber at a controlled rate. The effluent air from the chamber was collected at the ground surface and submitted to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015B.

## **2.0 DOCUMENTATION OF FIELD ACTIVITIES**

BB&J performed several soil gas and flux chamber surveys in conjunction with geotechnical investigations at various locations at the Subject Property. The following is a summary of those investigations:

---

<sup>3</sup> The MSC asphalt parking lot and office building were not a part of the Subject Property during this investigation. As such, the BB&J Phase II ESA refers to these locations as near the south property line; however, with the addition of the MSC asphalt parking lot and office building to the Subject Property, these locations are no longer located on the south property line.

## 2.1 BB&J Preliminary Soil Gas Investigation

BB&J oversaw the advancement of 15 soil gas probe locations (identified as SG-1 through SG-15) by Terra Trace Environmental Services (Terra Trace) to assess whether VOCs had volatilized into the soil. Eleven soil boring locations were positioned in the locations of the proposed town homes (a total of 11 town homes were proposed) throughout the central portion of the Subject Property. In addition, the remaining four soil gas samples were collected from the location of the proposed community center located in the south central portion of the Subject Property<sup>4</sup>.

The soil gas samples were obtained from a 2-inch diameter probe hole created by a track-mounted Geoprobe® drill rig. The Geoprobe® sampler with a solid point was advanced to a depth of approximately five feet bgs then was retracted approximately six inches. Dedicated ¼-inch diameter poly tubing was then inserted through the rods through a discrete sampling point to the six-inch space created by the retracting of the sampler. The dedicated tubing then extended from the six-inch space up through the rods and approximately four feet beyond. This tubing was then connected to a 60 milliliter (mL) plastic syringe with a three-way valve. Three times the dead volume, approximately four milliliters per foot or a total of 40 mLs, was then purged using the syringe. After purging, the syringe was then disconnected. The canister was then connected to the tubing using a ¼-inch Swagelok fitting. Leak tracer, consisting of isopropyl alcohol, was then sprayed on paper towels and the towels were placed around the base of the rods where they entered the ground and around the sampling assembly (i.e., the poly tubing and Swagelok connection). The valve was then opened on the canister and the reading on the vacuum gauge was then recorded. If the gauge read at least -25 inches of mercury, the canister was allowed to fill. When the gauge read zero inches of mercury the canister was disconnected, the canister was labeled with a ball point pen, wrapped in bubble wrap, and returned to the box in which it was shipped.

The sample name and collection time was then logged into the chain-of-custody to be sent along with the filled canisters back to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015B. The dedicated tubing was then removed and discarded and the rods and discrete sampling point were removed from the probe hole and decontaminated with a solution of Alconox®, non-phosphatic soap, and warm water. The drill rig was then moved to the next sample point and the aforementioned procedure was repeated.

## 2.2 BB&J Phase II ESA: Commercial Development

The BB&J Phase II ESA: Commercial Development was prepared to further address the COCs identified by BB&J within the BB&J Preliminary Soil Gas Investigation; however, this investigation was located primarily in the north portion of the Subject Property in the area of a proposed commercial development. More specifically, this investigation was conducted in the area of the north edge of the Former Quarry / Former CCDD fill operation.

---

<sup>4</sup> The location and position of the proposed community center has since changed the time of the BB&J Preliminary Soil Gas Investigation. The current proposed location of the community center is further to the south in the location of the MSC asphalt parking lot. No permanent structures are currently planned for this area of the Subject Property.

On May 11, 2007, BB&J oversaw the installation of three soil gas probes (CDSG-1, CDSG-2, and CDSG-3<sup>5</sup>) by Terra Trace. Using direct-push technology (i.e., Geoprobe®), Terra Trace created three holes in the subsurface located in each of the approximate centers of the three proposed commercial buildings on the north portion of the Subject Property.

The installation, equilibration time, and sampling procedures utilized by BB&J for the Soil Gas Survey were pursuant to the guidelines identified in the *Active Soil Gas Investigation Advisory* Section 2.2.5 A 1 and 2, created by the California Environmental Protection Agency (Cal EPA), dated January 28, 2003<sup>6</sup>. By use of direct-push technology (i.e., Geoprobe®), a soil probe was advanced to a depth of five feet bgs to create a hole for the soil vapor probe. Soil probes CDSG-1, CDSG-2, and CDSG-3 were installed to the bottom of the hole at an approximate depth of five feet bgs. Approximately one foot of sand was poured on top of the probe tip to a depth of five feet bgs to minimize disruption of airflow to the sampling tip. At least one foot of dry granular bentonite was poured on top of each sand pack to preclude the infiltration of hydrated bentonite grout. The probe was then filled to the surface with hydrated bentonite with the end of the soil gas probe tubing protruding from the subsurface. BB&J allowed for at least 30 minutes for the subsurface conditions to equilibrate before conducting purging and sampling activities.

The soil gas samples were collected using 400-mL Summa canisters, which were filled via 1/4-inch diameter poly tubing attached to the soil gas probe. This tubing was connected to a 60-mL plastic syringe with a three-way valve. Approximately 4 mLs per foot, or a total of 40 mLs (three times the dead volume), were then purged from the soil gas probe using the syringe. After purging, the syringe was then disconnected. The 400-mL canister was then connected to the tubing using a 1/4-inch Swagelok fitting. A leak tracer, consisting of isopropyl alcohol, was then sprayed on paper towels and the towels were placed around the sampling assembly (i.e., the poly tubing and Swagelok connection). The valve was then opened on the 400-mL canister and the reading on the vacuum gauge was then recorded. If the gauge read at least -25 inches of mercury, the canister was allowed to fill. When the gauge read zero inches of mercury, the canister was disconnected. The 400-mL canister was labeled with a ball point pen, wrapped in bubble wrap, and returned to the box in which it was shipped. BB&J personnel shipped the 400-mL Summa canister samples to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015.

### 2.3 BB&J Phase II ESA: Future Use

The BB&J Phase II ESA: Future Use Evaluation was prepared to further address the COCs identified by BB&J within the BB&J Preliminary Soil Gas Investigation. The scope of work included the collection of three soil gas samples from the former southeastern portion of the Subject Property<sup>7</sup>. BB&J also conducted a Flux Chamber Survey to assess ground surface

---

<sup>5</sup> The soil gas samples during this investigation were identified as CDSG to designate “commercial development soil gas” and to help differentiate between the soil gas samples collected during the BB&J’s Preliminary Soil Gas Investigation in the recreational use area located in the central portion of the Subject Property.

<sup>6</sup> This document was prepared by the California EPA Department of Toxic Substance Control (DTSC) and the Los Angeles Regional Water Quality Control Board (LARWQCB) to “ensure that consistent methodologies were applied during active soil gas investigations to produce high quality data for regulatory decision-making.” As there are no existing regulations for soil gas investigations in Illinois, this document was used as the California EPA DTSC and LARWQCB are two regulatory agencies at the forefront of soil gas investigations in the United States.

<sup>7</sup> As discussed previously in Section 2.1.5 and 2.1.6, the MSC asphalt parking lot and office building were not a part of the Subject Property during this investigation. As such, the BB&J Phase II ESA refers to these locations as near the south property line; however, with the addition of the MSC asphalt parking lot and office building to the Subject Property, these locations are no longer located on the south property line.

emission rates (or "flux") of VOCs from the subsurface (soil) beneath the central portion of the Subject Property and provide data for a preliminary risk evaluation based on the proposed outdoor recreational use of the Subject Property in the central portion of the Subject Property.

### 2.3.1 Soil Gas Survey

On May 11, 2007, BB&J installed three soil gas probes, SG-16, SG-17, and SG-18<sup>8</sup>, in probes used to collect soil during the soil investigation (GP-1, GP-2, and GP-3, respectively). The three soil gas probes were located on the former southern property boundary of the Subject Property, which is currently located within the area of the proposed community center.

The installation, equilibration time, and sampling procedures utilized by BB&J for the Soil Gas Survey were pursuant to the guidelines identified in the *Advisory - Active Soil Vapor Investigation* Section 2.2.5 A 1 and 2, created by the California EPA DTSC and the LARWQCB, dated January 28, 2003<sup>9</sup>.

Each soil probe used in the soil investigation (GP-1, GP-2, and GP-3) was backfilled with bentonite from the termination depth of 12 feet bgs to approximately six feet bgs. A soil gas probe tip and associated tubing was then inserted into the probe hole. Approximately one foot of sand was poured into the soil probe hole on top of the probe tip to a depth of five feet bgs to minimize the disruption of airflow to the probe tip. At least one foot of dry granular bentonite was poured on top of each sand pack to preclude the infiltration of hydrated bentonite grout. The probe was then filled to the surface with hydrated bentonite with the end of the soil gas probe tubing protruding from the subsurface. BB&J allowed for at least 30 minutes for the subsurface conditions to equilibrate before conducting purging and sampling activities.

The soil gas samples were collected using 400-mL Summa canisters, which were filled via 1/4-inch diameter poly tubing attached to the soil gas probe. This tubing was connected to a 60-mL plastic syringe with a three-way valve. Approximately 4 mLs per foot, or a total of 40-mL (three times the dead volume), were then purged from the soil gas probe using the syringe. After purging, the syringe was then disconnected. The 400-mL canister was then connected to the tubing using a 1/4-inch Swagelok fitting. A leak tracer, consisting of isopropyl alcohol, was then sprayed on paper towels and the towels were placed around the sampling assembly (i.e., the poly tubing and Swagelok connection). The valve was then opened on the 400-mL canister and the reading on the vacuum gauge was then recorded. If the gauge read at least -25 inches of mercury, the canister was allowed to fill. When the gauge read zero inches of mercury, the canister was disconnected. The 400-mL canister was labeled with a ball point pen, wrapped in bubble wrap, and returned to the box in which it was shipped. BB&J personnel shipped the 400-mL Summa canister samples to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015.

### 2.3.2 Flux Chamber Survey

---

<sup>8</sup> The soil gas probes were identified as SG-16, SG-17, and SG-18 to continue the numbering of soil gas samples collected during previous soil gas investigations at the Subject Property. 15 soil gas samples had previously been collected.

<sup>9</sup> This document was prepared by the California EPA DTSC and LARWQCB to "ensure that consistent methodologies were applied during active soil gas investigations to produce high quality data for regulatory decision-making." As there are no existing regulations for soil gas investigations in Illinois, this document was used as the California EPA DTSC and LARWQCB are two regulatory agencies at the forefront of soil gas investigations in the United States.

Beginning on May 21, 2007, BB&J conducted a Flux Chamber Survey to assess ground surface emission rates (or "flux") of VOCs from the subsurface (soil) beneath the Subject Property and provide data for a preliminary risk evaluation based on the proposed outdoor recreational use area of the Subject Property. A total of 13 soil flux chambers were utilized to collect soil gas throughout the surface of the Subject Property and in the recreational area on the east adjoining property. BB&J placed six flux chambers (SF-5, SF-6, SF-10, SF-11, SF-12, and SF-13<sup>10</sup>) on the ground surface during the afternoon of May 21, 2007 and packed soil around the flux chamber edges to create an air-tight environment inside the flux chambers. BB&J returned the morning of May 22, 2007 to collect the accumulated gas samples. On May 24, 2007 BB&J placed seven additional soil flux chambers (SF-1, SF-2, SF-3, SF-4, SF-5, SF-7, and SF-8) on the ground surface using the same method to ensure an air-tight environment. BB&J returned on May 25, 2007 to collect the additional soil flux samples. In addition, soil flux chamber SF-9 was placed on the ground on the afternoon of May 25, 2007 and was collected in the morning of May 26, 2007 using the same sampling methodologies described above.

As part of the sampling procedures for the flux chambers, an "initial" soil flux sample of the ambient air within the flux chamber was collected for each soil flux location by connecting the 400-mL Summa canister to the soil flux chamber once the flux chamber was placed on the ground and an air-tight environment had been created. The purpose of the "initial" soil flux samples was to evaluate whether any VOCs present at the surface of the ground were collected inside the flux chamber at the time the flux chamber was placed on the ground surface. Any subsequent soil flux samples that contained high concentrations of VOCs would then be compared to the "initial" soil flux sample to determine whether the high concentrations of VOCs were from soil gas collected at the time the flux chamber was placed on the ground surface<sup>11</sup>.

The flux chambers were then left overnight to collect gas from the subsurface and equilibrate<sup>12</sup>. The Subject Property is bordered by a fence and it is locked each evening to secure the Subject Property. The following morning, BB&J returned to the Subject Property to collect the incubated flux chamber samples using 400-mL Summa canisters. The soil flux samples were identified by the sample location and the time they were collected. BB&J personnel shipped the Summa canister samples to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015.

## **2.4 BB&J Phase II ESA: Community Center**

The BB&J Phase II ESA: Community Center was prepared to evaluate management and construction considerations related to the redevelopment of the southeast portion of the Subject Property as a proposed community center. This portion of the Subject Property was not located within the Former Quarry / Former CCDD Fill Operation. Three of the geotechnical soil borings were used to collect three soil gas samples at approximately five feet bgs. One soil flux sample was collected from the ground surface in this area.

### **2.4.1 Soil Gas Survey**

---

<sup>10</sup> Flux chamber SF-13 was located at Smith Park, near the intersection of 42<sup>nd</sup> Street and Lawndale Avenue, to serve as a background sample.

<sup>11</sup> Soil flux samples SF-3 t=0 and SF-9 t=0 were analyzed as the concentrations in the soil flux sample contained concentrations of VOCs.

<sup>12</sup> The soil flux chambers were situated on the ground and exposed to soil vapors for at least 8 hours.

On June 1, 2007 and June 4, 2007, BB&J oversaw the installation of three soil gas probes (CCSG-32, CCSG-33, and CCSG-35) in their respective soil boring locations.

The installation, equilibration time, and sampling procedures utilized by BB&J for the Soil Gas Survey were pursuant to the guidelines identified in the *Active Soil Gas Investigation Advisory* Section 2.2.5 A 1 and 2, created by the Cal EPA, dated January 28, 2003<sup>13</sup>. After sampling, the soil boring was backfilled to approximately five feet bgs to leave a hole for the soil vapor probe. Soil probes CCSG-32, CCSG-33, and CCSG-35 were installed to the bottom of the hole at an approximate depth of five feet bgs. Approximately one foot of sand was poured on top of the probe tip to a depth of five feet bgs to minimize disruption of airflow to the sampling tip. At least one foot of dry granular bentonite was poured on top of each sand pack to preclude the infiltration of hydrated bentonite grout. The probe was then filled to the surface with hydrated bentonite with the end of the soil gas probe tubing protruding from the subsurface. BB&J allowed for at least 30 minutes for the subsurface conditions to equilibrate before conducting purging and sampling activities.

The soil gas samples were collected using 400-mL Summa canisters, which were filled via 1/4-inch diameter poly tubing attached to the soil gas probe. This tubing was connected to a 60 mL plastic syringe with a three-way valve. Approximately 4 mL per foot, or a total of 40 mL (three times the dead volume), were then purged from the soil gas probe using the syringe. After purging, the syringe was then disconnected. The 400-mL canister was then connected to the tubing using a 1/4-inch Swagelok fitting. A leak tracer, consisting of isopropyl alcohol, was then sprayed on paper towels and the towels were placed around the sampling assembly (i.e., the poly tubing and Swagelok connection). The valve was then opened on the 400-mL canister and the reading on the vacuum gauge was then recorded. If the gauge read at least -25 inches of mercury, the canister was allowed to fill. When the gauge read zero inches of mercury, the canister was disconnected. The 400-mL canister was labeled with a ball point pen, wrapped in bubble wrap, and returned to the box in which it was shipped. BB&J personnel shipped the 400-mL Summa canister samples to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015.

#### 2.4.2 Limited Flux Chamber Survey

On June 6, 2007, BB&J conducted a Limited Flux Chamber Survey to assess ground surface emission rates (or “flux”) of VOCs from the subsurface (soil) beneath the Subject Property and provide data a preliminary risk evaluation based on the proposed community center use of the Subject Property. One soil flux chamber was utilized to collect soil gas in the footprint of the proposed community center. BB&J placed one flux chamber (CCSF-35) on the ground surface during the afternoon of June 6, 2007 and packed soil around the flux chamber edges to create an air-tight environment inside the flux chamber. BB&J returned the morning of June 7, 2007 to collect the accumulated gas sample.

As part of the sampling procedures for the flux chambers, an “initial” soil flux sample of the ambient air within the flux chamber was collected by connecting the 400-mL Summa canister to the soil flux chamber once the flux chamber was placed on the ground and an air-tight

---

<sup>13</sup> This document was prepared by the Cal EPA Department of Toxic Substance Control (DTSC) and Los Angeles Regional Water Quality Control Board (LARWQCB) to “ensure that consistent methodologies were applied during active soil gas investigations to produce high quality data for regulatory decision-making.” As there are no existing regulations for soil gas investigations in Illinois, this document was used as the Cal EPA DTSC and LARWQCB are two regulatory agencies at the forefront of soil gas investigations in the United States.

environment had been created. The purpose of the "initial" soil flux sample was to evaluate whether any VOCs present at the surface of the ground were collected inside the flux chamber at the time the flux chamber was placed on the ground surface. Any subsequent soil flux samples that contained high concentrations of VOCs would then be compared to the "initial" soil flux sample to determine whether the high concentrations of VOCs were from soil gas collected at the time the flux chamber was placed on the ground surface.

The flux chamber was then left overnight to collect gas from the subsurface and equilibrate<sup>14</sup>. The following morning, BB&J returned to the Subject Property to collect the incubated flux chamber samples using 400-mL Summa canisters. The soil flux samples were identified by the sample location and the time they were collected. BB&J personnel shipped the Summa canister samples to H&P Laboratory for analysis of VOCs by USEPA Method TO-15 and methane by USEPA Method 8015.

### 3.0 DISCUSSION OF ANALYTICAL RESULTS

#### 3.1 BB&J Preliminary Soil Gas Survey

BB&J utilized USEPA's on-line J&E calculator<sup>15</sup> to evaluate the vapor intrusion pathway into the proposed town homes and community center buildings. This J&E calculator replicates the implementation that the USEPA Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (OSWER Vapor Intrusion Guidance) used in developing its Vapor Intrusion Guidance but includes a number of enhancements that are facilitated by web implementation. The J&E calculator has become increasingly popular with regulators and consultants over the last 10 years and several manuscripts have been published on its use. It should be noted that the State of Illinois does not provide any guidance or soil gas standards with regard to vapor intrusion. However, BB&J understands that the IEPA is currently crafting draft guidance for vapor intrusion.

Briefly, the calculator is a one-dimensional analytical solution, which incorporates both advection and diffusion transport mechanisms to produce a unitless "attenuation factor." This attenuation factor is a measure of how soil and building properties limit the intrusion of organic vapors into overlying buildings and is defined as the concentration of the compound in indoor air divided by the concentration of the compound in soil gas or ground water.

Although the J&E calculator is inherently conservative, BB&J also made the following conservative assumptions in running the calculator:

- The highest soil gas concentration of a given constituent identified site-wide was assumed to be the concentration present site-wide (even if lower concentrations were identified elsewhere) for the proposed community center vapor intrusion scenario;
- OSWER Vapor Intrusion Guidance<sup>16</sup> allows a site risk manager to select media-specific target concentrations for screening at three cancer risk levels:  $10^{-4}$ ,  $10^{-5}$ , and  $10^{-6}$ ; however, BB&J compared the modeled results to the most conservative of these ( $10^{-6}$ );

<sup>14</sup> The soil flux chambers were situated on the ground and exposed to soil vapors for at least eight hours.

<sup>15</sup> <http://www.epa.gov/oswer/assessment/soilgas/soilgas.htm>

<sup>16</sup> <http://www.epa.gov/oswer/assessment/soilgas/soilgas.htm>

- A less protective, best estimate and more protective target concentration were computed for the maximum soil gas concentration of a given constituent detected at the Subject Property. These computed “backward” target concentrations served as comparison to the detected soil gas concentrations at the Subject Property. The best estimate concentrations are based on the best guesses of depth to the contamination source and residual moisture content for the chosen soil type. The less protective and more protective range of values is computed based on user-specified uncertainty in both depth to the COC source and unsaturated zone moisture content;
- The default J&E calculator uses default exposure factors for residential land use. When using the J&E calculator to determine the concentrations of soil gas entering the proposed community center, commercial/industrial land use exposure factors were used in the J&E calculator. The specific commercial/industrial default exposure factors used can be found in the USEPA Office of Emergency and Remedial Response Risk Assessment Guidance for Superfund (RAGS) Volume I, dated March 25, 1991, Summary of Standard Default Exposure Factors, Commercial/Industrial Land Use, Inhalation of Contaminants Exposure Pathway; and,
- For use in comparing the concentrations of soil gas detected at the proposed community center to Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs), a low prediction estimate, best estimate, and high prediction estimate were all evaluated for each constituent. The “forward” predictions were then compared to the OSHA PELs for each constituent. The best estimate results are based on the estimated assumptions regarding depth to the sample location and residual moisture content for the chosen soil type. The low prediction and high prediction range of values is computed based on user-specified uncertainty in both depth to the sample and unsaturated zone moisture content.

Based on the results of the soil gas survey at the Subject Property, BB&J ran the J&E calculator for the constituents reported to be present in at least one soil gas sample.

VOCs including constituents consistent with historic releases of gasoline, chlorinated solvents and oxygenated solvents were detected in the soil gas samples collected in the central portion of the Subject Property. Of these, the following COCs were estimated to result in indoor concentrations greater than the modeled “more-protective” Target Concentration for Estimated Risk-based Soil Gas Standards<sup>17</sup> under a proposed town home scenario:

- Benzene;
- TCE; and,
- Vinyl Chloride.

In addition to the VOCs detected at the proposed townhomes, two of the 11 soil gas samples contained concentrations within the lower explosive limit (LEL) and upper explosive limit

---

<sup>17</sup> These J&E calculations used residential default exposure factors due to the intended residential use of the proposed townhomes.

(UEL), and are considered to be within the explosive range for methane<sup>18</sup>. As previously indicated, however, a residential scenario is no longer being considered for the Subject Property. As of the date of this SIR, no residential redevelopment is proposed for any portions of the Subject Property. It should also be noted that the most conservative residential default exposure factors were used in the USEPA J&E model in these locations due to the former proposed residential use of this area of the Subject Property.

For samples collected in the vicinity of where the proposed community center was originally intended to be located, VOCs including constituents consistent with historic releases of gasoline, chlorinated solvents and oxygenated solvents, were detected in the soil gas samples collected in the central portion of the Subject Property. Furthermore, the following COCs were estimated to result in indoor concentrations greater than the modeled “more-protective” Target Concentrations for Estimated Risk-based Soil Gas Standards under a commercial scenario:

- Benzene;
- Carbon tetrachloride;
- 1,2-Dichloroethane;
- cis-1,2-Dichloroethane;
- Ethylbenzene;
- TCE; and,
- Vinyl chloride.

Using risk assessment parameters typical of an IEPA or USEPA-type Comprehensive Environmental Response, Compensation, and Liability Act [(CERCLA) i.e., Superfund] risk assessment, modeled cancer risks in this scenario were on the order of approximately 1,000 times greater than the  $10^{-6}$  bench mark used for risk assessment purposes. This risk is driven primarily by the high concentrations of vinyl chloride and TCE. In addition to the VOCs detected at the proposed community center, two of the four soil gas samples in this location contained concentrations within the explosive range for methane.

For purposes of comparison, Table 3 of the BB&J Preliminary Soil Gas Survey depicts whether the known concentrations of soil gas detected at the proposed community center would have the potential to exceed OSHA PELs for air contaminants, as identified in 29 CFR Part 1910 Occupational Safety and Health Standards “Limits for Air Contaminants” Tables Z-1 and Z-2. The OSHA PELs are based on 8-hour time weighted averages (TWAs). None of the COCs detected in the soil gas samples from the proposed community center exceeded the OSHA PELs; however, it should be noted that the OSHA PELs are more typically applied in industrial settings rather than a non-industrial workplace setting, such as the proposed community center. In addition, town hall meetings involving residents could be considered by IEPA or USEPA to constitute a non-workplace usage of the community center. Consequently, the OSHA PELs may constitute a less conservative standard, but possibly less applicable standard relative to those presented in Table 2 of the BB&J Preliminary Soil Gas Survey.

---

<sup>18</sup> According to the National Fire Protection Association (NFPA), the LEL for methane is 5.0%, while the UEL is 15%.

BB&J indicated that possible remedies to limit the exposure of these VOCs to the inhabitants of the proposed town homes and community center include installation of a subsurface vapor barrier beneath the proposed buildings at the Subject Property combined with engineered venting systems. Additionally, to ensure that methane would not accumulate beneath or within the proposed structures at the Subject Property, proper venting of those structures would be required to reduce the potential for explosions to occur.

However, BB&J stated that the modeling should be regarded as preliminary and should be used for guidance purposes only. Factors that may impact the accuracy of the model included, but were not limited to:

- The limited number of samples collected at the Subject Property relative to the overall size;
- Effects of proposed future grading activities;
- Estimated building air exchange rates used in the model relative to actual building air exchange rates;
- Characteristics of the soil proposed to be placed on top of the existing fill material during proposed grading activities; and,
- The degree to which the concrete slabs crack in the future due to possible subsidence resultant from the continued decay of materials in the subsurface or other unknown subsurface conditions.

It should be noted, however, that the proposed residential town homes and the proposed community center structure are no longer planned to be located at the locations atop where the soil gas samples were collected. As of the date of the SIR, no residential redevelopment is proposed for any portions of the Subject Property. Furthermore, the proposed community center has been moved to the location of the current MSC asphalt parking lot and building which was the south adjoining property at the date of the BB&J Preliminary Soil Gas Survey. The MSC asphalt parking lot and office building were not located on the Former Quarry / Former CCDD Fill Operation. Additionally, as discussed in greater detail below, soil flux samples were collected primarily in the western and central areas of the Subject Property surrounding the locations of the soil gas samples noted above as discussed in the BB&J Phase II ESA: Future Use Evaluation, to evaluate the potential human health effects of leaving these areas open. As discussed further in Section 3.2.2, the concentrations of COCs present in these soil gas samples were shown to dissipate to acceptable concentrations in open-air conditions or be absent by the time the gases migrated to the surface level.

### **3.2 BB&J Phase II ESA: Commercial Development**

Based on the results of the soil gas survey at the Subject Property, BB&J ran the J&E calculator for the constituents reported to be present in at least one soil gas sample in the same manner that was conducted during the BB&J Preliminary Soil Gas Survey.

The modeled results of the soil gas investigation indicated that PCE and TCE had the potential to accumulate within one of the proposed commercial developments at concentrations that could pose a human health risk. Using risk assessment parameters typical of an IEPA or USEPA-type CERCLA (i.e., Superfund) risk assessment, modeled cancer risk exceeded the benchmark  $10^{-6}$  (i.e., one in a million) cancer risk in the commercial scenario. This elevated risk is driven primarily by the presence of PCE and TCE. Results of the limited soil gas survey also indicated that concentrations of methane were not detected within the explosive range in all three locations.

It was noted that “(1) the Johnson-Ettinger model (the used to model the predict the target concentrations to compare to the soil gas concentrations detected bgs) is inherently conservative and (2) new soil [was] continually being placed at the Subject Property and, assuming the soil is devoid of VOC impacts, could serve as a barrier to VOC entry into the buildings.” Furthermore, BB&J suggested that to limit the exposure to these constituents, a subsurface vapor barrier with engineered venting systems would have to be installed below the proposed structures. Additionally, BB&J suggested that to limit the exposure to these constituents, possible remedies include a subsurface vapor barrier with engineered venting systems installed below the proposed structures. However, BB&J stated that the modeling should be regarded as preliminary and should be used for guidance purposes only. Factors that may impact the accuracy of the model included, but were not limited to:

- The limited number of samples collected at the Subject Property relative to the overall size;
- Effects of proposed future grading activities;
- Estimated building air exchange rates used in the model relative to actual building air exchange rates;
- Characteristics of the soil proposed to be placed on top of the existing fill material during proposed grading activities; and,
- The degree to which the concrete slabs crack in the future due to possible subsidence resultant from the continued decay of materials in the subsurface or other unknown subsurface conditions.

It should be noted, however, that the proposed commercial buildings are no longer planned to be located at the locations atop where the soil gas samples were collected. As of the date of this report, the proposed commercial buildings are to be moved north toward Ogden Avenue and away from the Former Quarry / Former CCDD Fill Operation.

### **3.3 BB&J Phase II ESA: Future Use**

#### **3.3.1 Limited Soil Gas Survey**

BB&J conducted a limited soil gas survey from the three locations where the soil samples were collected along the former southeast portion of the Subject Property. Based on the results of the soil gas survey at the Subject Property, BB&J ran the J&E calculator for the constituents reported to be present in at least one soil gas sample in the same manner that was conducted during the BB&J Preliminary Soil Gas Survey.

The modeled results of the soil gas investigation indicated that vinyl chloride had the potential to accumulate within a proposed building in this area at concentrations that could pose a human health risk. Using risk assessment parameters typical of an IEPA or USEPA-type CERCLA, i.e., Superfund risk assessment, modeled cancer risks under the most protective scenario slightly exceeded the  $10^{-6}$  bench mark used for risk assessment purposes. Results of the limited soil gas survey also indicated that concentrations of methane were not detected within the explosive range in all three locations.

It was noted, however, that “(1) the Johnson-Ettinger model... is inherently conservative and (2) new soil is continually being placed at the Subject Property and, assuming the soil is devoid of VOC impacts, could serve as a barrier to VOC entry into the buildings.” Additionally, BB&J suggested that to limit the exposure to these constituents, possible remedies include a subsurface vapor barrier with engineered venting systems installed below the proposed structures. However, BB&J stated that the modeling should be regarded as preliminary and should be used for guidance purposes only. Factors that may impact the accuracy of the model included, but were not limited to:

- The limited number of samples collected at the Subject Property relative to the overall size;
- Effects of proposed future grading activities;
- Estimated building air exchange rates used in the model relative to actual building air exchange rates;
- Characteristics of the soil proposed to be placed on top of the existing fill material during proposed grading activities; and,
- The degree to which the concrete slabs crack in the future due to possible subsidence resultant from the continued decay of materials in the subsurface or other unknown subsurface conditions.

### 3.3.2 Flux Chamber Survey

Following the limited soil gas survey, a soil flux survey was conducted within the central portion of the Subject Property to determine whether the COCs identified in BB&J's previous soil gas surveys were present at the surface near the surface of the Subject Property. Using the laboratory analytical data collected from the soil flux samples, BB&J calculated the predicted concentration in the air at approximately five feet above the ground surface for each of the constituents detected in the soil flux samples to determine a preliminary risk assessment for the future recreational use of the Subject Property. Using risk assessment parameters typical of an IEPA or USEPA-type CERCLA risk assessment, modeled cancer risks in this calculation of each detected VOC were less than the  $10^{-6}$  (one in a million) bench-mark used for risk assessment purposes.

In comparison with soil gas concentrations detected as part of the limited soil gas survey and previous limited soil gas surveys completed at the Subject Property, the laboratory data collected and modeled scenarios suggest that the detected constituents present at six feet bgs are significantly dissipated or are absent at the surface of the Subject Property. Possible remedies to limit the exposure of this VOC to the proposed building on the south portion of the Subject

Property include installation of a subsurface vapor barrier beneath the proposed buildings at the Subject Property combined with engineered venting systems.

However, it should be noted that since the time of this report, the proposed future development of the Subject Property will include the installation of an approximately 3-foot thick clean soil cap or an approximately 1-foot clean clay cap in the recreation area. Further, a vapor barrier and passive vent system is currently proposed for the proposed community center.

### **3.4 BB&J Phase II ESA: Future Use**

#### **3.4.1 Limited Soil Gas Survey**

BB&J conducted a limited soil gas survey from the three locations from the southeast portion of the Subject Property: two of which were located on the exterior of the proposed footprint of the community center, one located within the proposed footprint. Based on the results of the soil gas survey at the Subject Property, BB&J ran the J&E calculator for the constituents reported to be present in two soil gas samples in the same manner that was conducted during the BB&J Preliminary Soil Gas Survey.

The modeled results of the soil gas investigation indicated that the sample location within the proposed footprint contained concentrations of TCE, while the sample location located outside the proposed footprint contained concentrations of vinyl chloride that had the potential to accumulate within a proposed building in this area at concentrations that could pose a human health risk. Using risk assessment parameters typical of an IEPA or USEPA-type Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, i.e., Superfund) risk assessment, modeled cancer risks in this scenario were on the order of approximately one in 1,000,000 chance per employee developing cancer directly attributable to vapor intrusion into the community center due to on-site sources. Results of the limited soil gas survey also indicated that a concentration of methane was detected within the explosive range for one location within the footprint of the proposed community center.

However, BB&J stated that the modeling should be regarded as preliminary and should be used for guidance purposes only. Factors that may impact the accuracy of the model included, but were not limited to:

- The limited number of samples collected at the Subject Property relative to the overall size;
- Effects of proposed future grading activities;
- Estimated building air exchange rates used in the model relative to actual building air exchange rates;
- Characteristics of the soil proposed to be placed on top of the existing fill material during proposed grading activities; and,
- The degree to which the concrete slabs crack in the future due to possible subsidence resultant from the continued decay of materials in the subsurface or other unknown subsurface conditions.

### 3.4.2 Flux Chamber Survey

One soil flux sample was also collected from the southeast portion of the Subject Property to determine whether the COCs identified BB&J's previous soil gas survey were present at the surface of the Subject Property. The results indicated that the constituents detected within previous soil gas surveys were significantly dissipated at the surface of the soil.

Using the laboratory analytical data collected from the soil flux samples, BB&J calculated the predicted concentration in the air at approximately five feet above the ground surface for each of the constituents detected in the soil flux samples to determine a preliminary risk assessment for the future recreational use of the Subject Property. Using risk assessment parameters typical of an IEPA or USEPA-type CERCLA risk assessment, modeled cancer risks in this calculation of each detected VOC were less than the  $10^{-6}$  (one in a million) bench-mark used for risk assessment purposes.

In comparison with soil gas concentrations detected as part of the limited soil gas survey and previous limited soil gas surveys completed at the Subject Property, the laboratory data collected and modeled scenarios suggest that the detected constituents present at six feet bgs are significantly dissipated or are absent at the surface of the Subject Property. Possible remedies to limit the exposure of this VOC to the proposed building on the south portion of the Subject Property include installation of a subsurface vapor barrier beneath the proposed buildings at the Subject Property combined with engineered venting systems. However, it should be noted that since the time of this report, the proposed future development of the Subject Property will include the installation of an approximately 3-foot thick clean soil cap or an approximately 1-foot clean clay cap in the recreation area. Further, a vapor barrier and passive vent system is currently proposed for the proposed community center.

*Village of Lyons ' Quarry Reclamation District TIF #4  
0311715101 - Cook County  
BB&J Project No. 0259004*

*Comprehensive Site Investigation Report  
October 31, 2007*

**ATTACHMENT**

**BB&J 2007 Preliminary Soil Gas Investigation**

February 23, 2007

Village of Lyons c/o Robert K. Bush, Esq.  
Ancel Glink Diamond Bush Dicianni & Krafthefer, P.C.  
140 South Dearborn Street  
Chicago Illinois 60603

Subject: **Report of Limited and Preliminary Soil Gas Investigation  
Southwest Corner of Ogden and Lawndale Avenues  
Lyons, Illinois  
BB&J Project No. 0236901**

Dear Mr. Bush:


Bradburne, Briller & Johnson, LLC (BB&J) is pleased to provide the Village of Lyons with this *Report of Limited and Preliminary Soil Gas Investigation* (Preliminary Soil Gas Investigation) for the parcel of land located at the southwest corner of Ogden and Lawndale Avenues in Lyons, Cook County, Illinois (Subject Property). This project was performed in accordance with the Scope of Work outlined in BB&J's Proposal No. PN6-0296, dated January 23, 2007.

We appreciate the opportunity to provide you with our environmental consulting services. If you have any questions or require additional information, please call.

Sincerely,

**BRADBURNE, BRILLER & JOHNSON, LLC**

Kevin McCartney  
Project Manager

  
Andy Bajorat, CHMM  
Senior Scientist

J. Tim Bradburne, P. G.  
Principal

# **LIMITED AND PRELIMINARY SOIL GAS INVESTIGATION REPORT**

**Village of Lyons  
c/o Robert K. Bush, Esq.  
Ancel Glink Diamond Bush Dicianni & Krafthefer, P.C.  
140 South Dearborn Street  
Chicago Illinois 60603**

Submitted to:

**Village of Lyons  
c/o Robert K. Bush, Esq.  
Ancel Glink Diamond Bush Dicianni & Krafthefer, P.C.  
Chicago, Illinois**

Prepared by:

**BRADBURNE, BRILLER & JOHNSON, LLC  
Chicago, Illinois**

February 23, 2007

## TABLE OF CONTENTS

1.0	BACKGROUND .....	1
2.0	OBJECTIVE .....	1
3.0	SUBSURFACE INVESTIGATION .....	2
3.1	Pre-Mobilization Activities .....	2
3.2	Soil Gas Survey .....	2
4.0	FINDINGS AND ANALYTICAL RESULTS .....	3
4.1	Laboratory Analytical Results .....	3
4.2	Soil Gas Results .....	4
5.0	VAPOR INTRUSION MODELING .....	4
5.1	Johnson and Ettinger Calculations .....	4
5.2	Results .....	6
5.2.1	Proposed Residential Area .....	6
5.2.2	Proposed Community Center Area .....	7
6.0	CONCLUSIONS .....	8
6.1	Soil Gas Survey and Vapor Intrusion Modeling .....	8
6.2	Conclusions and Recommendations .....	9

## TABLES

Table 1:	Summary of Soil Gas Laboratory Analytical Results from Proposed Townhomes
Table 2:	Summary of Soil Gas Laboratory Analytical Results from Proposed Community Center
Table 3:	Summary of Soil Gas Laboratory Analytical Results from Proposed Community Center & OSHA PELs

## FIGURES

Figure 1:	Site Location Map
Figure 2:	Site Plan Showing Soil Gas Survey Locations
Figure 3:	Soil Gas Survey on Proposed Layout of Subject Property

## APPENDICES

Appendix A:	Field Procedures
Appendix B:	Laboratory Analytical Reports

## **1.0 BACKGROUND**

BB&J conducted a Preliminary Soil Gas Investigation for the parcel of land located on the southwest corner of Ogden and Lawndale Avenues in Lyons, Illinois (Subject Property). The Subject Property, which was formerly used as a quarry, appears to have been backfilled from 20 feet below ground surface to the surface with black cinders or coarse-graded asphalt (based on a review of soil boring logs prepared by H.H. Holmes) and fill material. It is unknown what type of fill material was present at greater depths. The origin of the deeper fill material is unknown, some of which may require excavation or be disturbed during site redevelopment.

BB&J understands that the entirety of the Subject Property will be redeveloped such that an engineered barrier would be constructed site-wide. Because the Subject Property is being considered for residential and commercial mixed-use development, it was requested of BB&J to conduct an investigation to evaluate the potential the subsurface to be impacted with constituents of concern (COCs). When the Subject Property was transferred by Materials Service Corporation to the Village of Lyons a provision in the real estate purchase agreement prevented the new owner from collecting samples for environmental profiling at depths greater than five feet below ground surface (bgs). Due to (1) the historic use of the Subject Property as construction and demolition debris fill operation, (2) the area targeted for site redevelopment was situated on top of the historic fill area, and (3) given that there were restrictions placed on the depth at which soil and/or groundwater samples could be collected, it was determined that a limited shallow preliminary soil gas investigation could possibly reveal the presence and type of COCs that could be present onsite.

Based on the information known about the Subject Property and the surrounding properties, the unknown source of the fill material has been identified as a potential recognized environmental condition (REC).

## **2.0 OBJECTIVE**

The objective of this project was to assess the potential for COCs to be present at the Subject Property in association with the fill material, as discussed in Section 1.0.

### 3.0 SUBSURFACE INVESTIGATION

The following sections present a summary of the subsurface assessment activities conducted for the Subject Property.

#### 3.1 Pre-Mobilization Activities

Prior to initiating field activities, BB&J prepared a Health and Safety Plan (HSP) for use by BB&J's on-site representative to address known and suspected site-specific COCs, potential site and work-related hazards, and additional health and safety issues. In addition, BB&J contacted the approved Illinois utility-locating companies to clear the underground utilities on January 26, 2007 (over 72 hours prior to field work).

#### 3.2 Soil Gas Survey

On February 1 and 2, 2007, BB&J conducted a soil gas survey throughout the Subject Property. Soil gas samples were collected using 400-milliliter summa canisters. Soil gas samples were collected at 15 soil boring locations (SB-1 through SB-15) at a depth of approximately five feet below ground surface (bgs). The samples were obtained from a 2-inch diameter probe hole created by a track-mounted Geoprobe® drill rig. The Geoprobe® sampler with a solid point was advanced to a depth of approximately five feet bgs then was retracted approximately six inches. Dedicated ¼-inch diameter poly tubing was then inserted through the rods through a discrete sampling point to the six-inch space created by the retracting of the sampler. The dedicated tubing then extended from the six-inch space up through the rods and approximately four feet beyond. This tubing was then connected to a 60 milliliter plastic syringe with a three-way valve. Three times the dead volume, approximately four milliliters per foot or a total of 40 milliliters, was then purged using the syringe. After purging, the syringe was then disconnected. The canister was then connected to the tubing using a ¼-inch swagelok fitting. Leak tracer, consisting of isopropyl alcohol, was then sprayed on paper towels and the towels were placed around the base of the rods where they entered the ground and around the sampling assembly (i.e., the poly tubing and swagelok connection). The valve was then opened on the canister and the reading on the vacuum gauge was then recorded. If the gauge read at least -25 inches of mercury, the canister was allowed to fill. When the gauge read zero inches of mercury the canister was disconnected, the canister was labeled with a ball point pen, wrapped in bubble wrap, and returned to the box in which it was shipped.

The sample name and collection time was then logged into the chain-of-custody to be sent along with the filled canisters back to the laboratory for analysis of volatile organic compounds (VOCs) by United States

Environmental Protection Agency (USEPA) Method TO-15 and methane by USEPA Method 8015B. The dedicated tubing was then removed and discarded and the rods and discrete sampling point were removed from the probe hole and decontaminated with a solution of Alconox<sup>®</sup>, non-phosphatic soap, and warm water. The drill rig was then moved to the next sample point and the aforementioned procedure was repeated.

#### 4.0 FINDINGS AND ANALYTICAL RESULTS

The following sections present the subsurface assessment findings and a summary of the laboratory analytical results.

##### 4.1 Laboratory Analytical Results

It is BB&J's understanding that the Subject Property is being considered for residential and commercial development. Therefore, BB&J utilized USEPA's on-line Johnson and Ettinger (J&E) (Johnson and Ettinger, 1991) calculator<sup>1</sup> to compare the results of the soil gas survey to potential vapor intrusion pathways into the proposed townhomes and community center buildings. In using the J&E calculator, BB&J utilized both residential and commercial exposure factors as the Subject Property is being developed for both residential and commercial use<sup>2</sup>.

A summary of the soil gas analytical results for samples collected from proposed townhome locations are compared to J&E calculated Estimated Risk-based Soil Gas Standards for a residential scenario in Table 1. A summary of the soil gas analytical results for samples collected from community center locations are compared to J&E calculated Estimated Risk-based Soil Gas Standards for a commercial scenario in Table 2. Modeled indoor air concentrations at the proposed community center are compared to the Occupational Health and Safety Administration (OSHA) Permissible Exposure Limits (PELs) for Air Contaminants in Table 3<sup>3,4</sup>.

---

<sup>1</sup> <http://www.epa.gov/osg/JohnsonEttingerCalculator.htm>

<sup>2</sup> The default J&E calculator uses default exposure factors for residential land use. When using the J&E calculator to determine the concentrations of soil gas entering the proposed community center, commercial/industrial land use exposure factors were used in the J&E calculator. The specific commercial/industrial default exposure factors used can be found in the USEPA Office of Emergency and Remedial Response *Risk Assessment Guidance For Superfund Volume 1: Human Health Evaluation Manual* (RAGS Volume I), dated March 25, 1991, Summary of Standard Default Exposure Factors, Commercial/Industrial Land Use, Inhalation of Contaminants Exposure Pathway.

<sup>3</sup> As discussed in the USEPA's 2002 *Draft Guidance For Evaluating the Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils* (Vapor Intrusion Guidance), Section I.D.1 of the Vapor Intrusion Guidance states that the Occupational Safety and Health Administration (OSHA) and USEPA "have agreed that OSHA generally will take the lead in addressing occupational exposures." As such, BB&J compared the modeled indoor air concentrations to OSHA's PELs, which are expressed as time-weighted averages (TWAs).

<sup>4</sup> OSHA is the Federal agency responsible for workplace safety and health. OSHA created indoor air standards that are designed to protect workers in industrial occupational environments. In the past, OSHA focused primarily on

## 4.2 Soil Gas Results

Numerous VOCs were detected in soil gas samples throughout the Subject Property by USEPA TO-15 analysis, including:

- |                          |                            |                                  |
|--------------------------|----------------------------|----------------------------------|
| • Acetone                | • trans-1,2-Dichloroethene | • 1,1,1-Trichloroethane          |
| • Benzene                | • Ethylbenzene             | • Trichloroethene (TCE)          |
| • 2-Butanone             | • 4-Ethyltoluene           | • Trichlorofluoromethane         |
| • Carbon disulfide       | • n-Heptane                | • 1,1,2-Trichlorotrifluoroethane |
| • Carbon tetrachloride   | • n-Hexane                 | • 1,2,4-Trimethylbenzene         |
| • Chloromethane          | • 4-Methyl-2-pentanone     | • 1,3,5-Trimethylbenzene         |
| • Cyclohexane            | • Styrene                  | • Vinyl chloride                 |
| • 1,2-Dichloroethane     | • Tetrachloroethene        | • m,p-Xylene                     |
| • 1,1-Dichloroethene     | • Toluene                  | • o-Xylene                       |
| • cis-1,2-Dichloroethene |                            |                                  |

In addition, methane was detected in each of the 15 soil gas samples using a modified version of USEPA Method 8015B. Specific locations and concentrations of each of these are presented in Tables 1, 2 and 3. Further discussion of these results is provided in Section 5.2.

## 5.0 VAPOR INTRUSION MODELING

Vapor intrusion is the migration of volatile chemicals from the subsurface into overlying buildings. Volatile chemicals in buried wastes and/or impacted groundwater can emit vapors that may migrate through subsurface soil and into air spaces of overlying buildings.

### 5.1 Johnson and Ettinger Calculations

BB&J utilized USEPA's on-line Johnson and Ettinger (J&E) (Johnson and Ettinger, 1991) calculator<sup>5</sup> to evaluate the vapor intrusion pathway into the proposed townhomes and community center buildings. This J&E calculator replicates the implementation that the USEPA Office of Solid Waste and Emergency

---

industrial worksites, but most recently has broadened its efforts to address other worksite hazards. In spring 1994, OSHA introduced a proposed rule regarding indoor air quality in non-industrial environments, although the proposal was withdrawn in December 2001 (USEPA – Air Indoor Quality: <http://www.epa.gov/iaq/index.html>).

<sup>5</sup> [http://www.epa.gov/athens/learn2model/part-two/onsite/jne\\_results\\_forward.htm](http://www.epa.gov/athens/learn2model/part-two/onsite/jne_results_forward.htm)

Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (OSWER Vapor Intrusion Guidance) used in developing its Vapor Intrusion Guidance but includes a number of enhancements that are facilitated by web implementation. The J&E calculator has become increasingly popular with regulators and consultants over the last 10 years and several manuscripts have been published on its use. It should be noted that the State of Illinois does not provide any guidance or soil gas standards with regard to vapor intrusion.

Briefly, the calculator is a one-dimensional analytical solution, which incorporates both advection and diffusion transport mechanisms to produce a unitless "attenuation factor." This attenuation factor is a measure of how soil and building properties limit the intrusion of organic vapors into overlying buildings and is defined as the concentration of the compound in indoor air divided by the concentration of the compound in soil gas or ground water.

Although the J&E calculator is inherently conservative, BB&J also made the following conservative assumptions in running the calculator:

- The highest soil gas concentration of a given constituent identified site-wide was assumed to be the concentration present site-wide (even if lower concentrations were identified elsewhere) for the community center vapor intrusion scenario (i.e., as presented in Table 3);
- OSWER Vapor Intrusion Guidance<sup>6</sup> allows a site risk manager to select media-specific target concentrations for screening at three cancer risk levels:  $10^{-4}$ ,  $10^{-5}$ , and  $10^{-6}$ ; however, BB&J compared the modeled results to the most conservative of these ( $10^{-6}$ );
- A less protective, best estimate and more protective target concentration were computed for the maximum soil gas concentration of a given constituent detected at the Subject Property. These computed "backward" target concentrations served as comparison to the detected soil gas concentrations at the Subject Property. The best estimate concentrations are based on the best guesses of depth to the contamination source and residual moisture content for the chosen soil type. The less protective and more protective range of values is computed based on user-specified uncertainty in both depth to the contamination source and unsaturated zone moisture content;
- The default J&E calculator uses default exposure factors for residential land use. When using the J&E calculator to determine the concentrations of soil gas entering the proposed community center, commercial/industrial land use exposure factors were used in the J&E calculator. The specific commercial/industrial default exposure factors used can be found in the USEPA Office of Emergency and Remedial Response RAGS Volume I, dated March 25, 1991, Summary of Standard Default Exposure Factors, Commercial/Industrial Land Use, Inhalation of Contaminants Exposure Pathway; and,

---

<sup>6</sup> <http://www.epa.gov/correctiveaction/eis/vapor/complete.pdf>

- For use in comparing the concentrations of soil gas detected at the proposed community center to OSHA PELs, a low prediction estimate, best estimate, and high prediction estimate were all evaluated for each constituent. The “forward” predictions were then compared to the OSHA PELs for each constituent. The best estimate results are based on the estimated assumptions regarding depth to the sample location and residual moisture content for the chosen soil type. The low prediction and high prediction range of values is computed based on user-specified uncertainty in both depth to the sample and unsaturated zone moisture content.

Based on the results of the soil gas survey at the Subject Property, BB&J ran the J&E calculator for the constituents reported to be present in at least one soil gas sample (see Section 4.2).

## 5.2 Results

The soil gas survey results for both the residential and community center scenarios are presented below:

### 5.2.1 Proposed Residential Area

As indicated in Table 1, multiple VOCs, including constituents consistent with historic releases of gasoline, chlorinated solvents and oxygenated solvents, were detected in the soil gas samples collected site-wide. Of these, the following constituents of concern (COCs) were estimated to result in indoor concentrations greater than the modeled “more-protective” Target Concentration for Estimated Risk-based Soil Gas Standards<sup>7</sup>:

- Benzene;
- TCE; and,
- Vinyl Chloride.

Collectively, modeled cancer risks in the residential scenario were on the order of approximately 50 times greater than the  $10^{-6}$  bench mark used for risk assessment purposes. Plainly stated, the modeled results indicate an approximately one in 20,000 chance per resident of developing cancer directly attributable to vapor intrusion into the townhomes due to on-site sources in some locations. Specifically, vinyl chloride has been identified by the United States Department of Health and Human Services to be associated with brain, liver, lung, and certain blood cancers<sup>8</sup>. Similarly, TCE is “reasonably anticipated” to be associated

<sup>7</sup> These J&E calculations used residential default exposure factors due to the intended residential use of the proposed townhomes.

<sup>8</sup> <http://www.atsdr.cdc.gov/tfacts20.html#bookmark06>

with liver, kidney, or lung cancer<sup>9</sup>, and benzene is a known carcinogen associated with leukemia, particularly acute myelogenous leukemia<sup>10</sup>.

In addition to the VOCs detected at the proposed townhomes, as indicated in Table 1 methane was detected in each soil gas sample from these locations. Two of the 11 soil gas samples contained concentrations within the lower explosive limit (LEL) and upper explosive limit (UEL), and are considered to be within the explosive range for methane<sup>11</sup>.

### 5.2.2 Proposed Community Center Area

As indicated in Table 2, multiple VOCs, including constituents consistent with historic releases of gasoline, chlorinated solvents and oxygenated solvents, were detected in the soil gas samples collected sitewide.. Furthermore, the following COCs were estimated to result in indoor concentrations greater than the modeled "more-protective" Target Concentrations for Estimated Risk-based Soil Gas Standards<sup>12</sup>:

- Benzene;
- Carbon tetrachloride;
- 1,2-Dichloroethane;
- cis-1,2-Dichloroethane;
- Ethylbenzene;
- TCE; and,
- Vinyl chloride.

Using risk assessment parameters typical of an Illinois Environmental Protection Agency (IEPA) or USEPA-type Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, i.e., Superfund) risk assessment, modeled cancer risks in this scenario were on the order of approximately 1,000 times greater than the  $10^{-6}$  bench mark used for risk assessment purposes. Plainly stated, the modeled results indicate an approximately one in 1,000 chance per employee developing cancer directly attributable to vapor intrusion into the community center due to on-site sources. This risk is driven

<sup>9</sup> <http://www.atsdr.cdc.gov/tfacts19.html#bookmark06>

<sup>10</sup> <http://www.atsdr.cdc.gov/tfacts3.html#bookmark06>

<sup>11</sup> According to the National Fire Protection Association (NFPA), the LEL for methane is 5.0%, while the UEL is 15%.

<sup>12</sup> These J&E calculations used commercial/industrial default exposure factors due to the intended commercial use of the proposed community center.

primarily by the high concentrations of vinyl chloride and TCE, which as described in Section 5.2.1., are known or suspected carcinogens.

In addition to the VOCs detected at the proposed community center, as indicated in Table 2 methane was detected in each soil gas sample from these locations. Two of the four soil gas samples contained concentrations within the explosive range for methane.

For purposes of comparison, Table 3 depicts whether the known concentrations of soil gas detected at the proposed community center would have the potential to exceed OSHA PELs for air contaminants, as identified in 29 Code of Federal Regulations (CFR) Part 1910 Occupational Safety and Health Standards "Limits for Air Contaminants" Tables Z-1 and Z-2. The OSHA PELs are based on 8-hour time weighted averages (TWAs). None of the COCs detected in the soil gas samples from the proposed community center exceeded the OSHA PELs; however, it should be noted that the OSHA PELs are more typically applied in industrial settings rather than a non-industrial workplace setting, such as the proposed community center. In addition, town hall meetings involving residents would likely be considered by IEPA or USEPA to constitute a non-workplace usage of the community center. Consequently, the OSHA PELs may constitute a less conservative standard, but possibly less applicable standard relative to those presented in Table 2.

## **6.0 CONCLUSIONS**

Based on the information presented in Sections 1.0 through 5.0 of this Report, BB&J offers the following conclusions and recommendations for the Subject Property.

### **6.1 Soil Gas Survey and Vapor Intrusion Modeling**

As indicated above, multiple VOCs, including constituents consistent with historic releases of gasoline, chlorinated solvents and oxygenated solvents, were detected in the soil gas samples collected statewide. Based on modeled results using default exposure factors for residential and commercial scenarios, cancer risks exceeded the benchmark  $10^{-6}$  (i.e., one in a million) cancer risk in both the residential and commercial scenarios. These elevated risks are driven primarily by the presence of vinyl chloride and TCE; however, a number of other known or suspected carcinogens were also identified.

With respect to the community center, modeled indoor air concentrations were compared to the OSHA PELs. None of the COCs detected in the soil gas samples from the proposed community center exceeded

the OSHA PELs (see Table 3). OSHA often asserts jurisdiction over state or federal environmental authorities in a workplace setting; however, it should be noted that the OSHA PELs are more typically applied in industrial settings rather than a non-industrial workplace setting, such as the proposed community center. In addition, town hall meetings involving residents would likely be considered by IEPA or USEPA to constitute a non-workplace usage of the community center. Consequently, the OSHA PELs may constitute a less conservative standard, but possibly less applicable standard relative to those presented in Table 2.

In addition to the chronic hazards potentially present at the Subject Property, concentrations of methane were reported to be present in four of the 15 samples collected site-wide at concentrations within the explosive range for methane.

A detailed discussion of all of these findings is presented in Section 5.2.

## **6.2 Conclusions and Recommendations**

As indicated in Tables 1 and 2, concentrations of multiple VOCs were detected above the modeled “more-protective” Target Concentrations for Estimated Risk-based Soil Gas Standards. In particular, TCE and vinyl chloride were detected in concentrations two to three orders of magnitude greater than the modeled “more-protective” Target Concentrations for Estimated Risk-based Soil Gas Standards. Such concentrations suggest that these constituents have the potential to accumulate within the proposed townhomes and community center at concentrations that would pose a human health risk. Possible remedies to limit the exposure of these constituents to inhabitants of the proposed townhomes and community center include installation of a subsurface vapor barrier beneath the proposed buildings at the Subject Property combined with engineered venting systems. Both the subsurface vapor barrier and the venting subsurface would require maintenance and upkeep for the lifetime of the buildings. In addition, the venting system would require air permits from IEPA to discharge the VOCs into the ambient air.

The presence of methane within its explosive range at various locations at the Subject Property also should be noted and explored further. To ensure that methane would not accumulate beneath or within the proposed structures at the Subject Property, proper venting of those structures would be required to reduce the potential for explosions to occur. The presence of methane detected site-wide may indicate that material inconsistent with IEPA’s definition of clean construction and demolition debris may be present beneath the surface of the Subject Property. As the material decomposes, shifting of the

subsurface may occur, causing structural damage to overlying structures, including the proposed townhomes and community center.

The specific sources of the VOCs and methane could not be determined by the limited scope of this investigation. However, BB&J understands that a gasoline station was formerly located on the northeast portion of the Subject Property near the intersection of Ogden Avenue and Lawndale Avenue. A leaking underground storage tank (LUST) incident was reported for the gasoline station and a No Further Remediation (NFR) letter was issued for the LUST incident. Despite the issuance of the NFR, the gasoline station may still be the source of the gasoline-related compounds, partly or wholly.

Sources of the chlorinated solvents and non-chlorinated solvents have not been identified. While these constituents were identified in varying concentrations site-wide, the highest concentrations were identified in the samples collected in the southeastern portion of the Subject Property.

The modeling conducted by BB&J should be regarded as preliminary and should be used for guidance purposes only. Factors that may impact the accuracy of the model include, but are not limited to:

- The limited number of samples collected at the Subject Property relative to the overall size;
- Effects of proposed future grading activities;
- Estimated building air exchange rates used in the model relative to actual building air exchange rates;
- Characteristics of the soil proposed to be placed on top of the existing fill material during proposed grading activities; and,
- The degree to which the concrete slabs crack in the future due to possible subsidence resultant from the continued decay of materials in the subsurface or other unknown subsurface conditions.

## **TABLES**

Table 1: Summary of Soil Gas Laboratory Analytical Results from Proposed Townhomes

Soil - Gas ID Soil Sample Depth <sup>2</sup>												Maximum Concentration Detected at Townhomes	BACKWARD Results of Johnson & Ettinger Vapor Intrusion Model - Estimated Risk-based Soil Gas Standards <sup>1</sup>			Explosive Range	
	SB-1 (ug/m <sup>3</sup> )	SB-2 (ug/m <sup>3</sup> )	SB-3 (ug/m <sup>3</sup> )	SB-4 (ug/m <sup>3</sup> )	SB-5 (ug/m <sup>3</sup> )	SB-6 (ug/m <sup>3</sup> )	SB-7 (ug/m <sup>3</sup> )	SB-8 (ug/m <sup>3</sup> )	SB-9 (ug/m <sup>3</sup> )	SB-10 (ug/m <sup>3</sup> )	SB-11 (ug/m <sup>3</sup> )	ug/m <sup>3</sup>	Less Protective Target Concentration (ug/m <sup>3</sup> )	Best Estimate Target Concentration (ug/m <sup>3</sup> )	More Protective Target Concentration (ug/m <sup>3</sup> )	Lower Explosive Limit (LEL) <sup>3</sup> (%)	Upper Explosive Limit (UEL) <sup>3</sup> (%)
<b>USEPA Method T0-15 (VOCs)</b>																	
Acetone	ND	62	310	100	ND	41	ND	ND	ND	200	ND	310	562,000	199,900	111,700	NA	NA
Benzene	11	ND	34	27	92	32	84	24	37	<b>160</b> <sup>4</sup>	130	<b>160</b>	938.6	228	114.4	NA	NA
2-Butanone (MEK)	14	7.6	75	37	14	15	18	7.5	11	37	11	75	2,359,000	767,700	381,100	NA	NA
Carbon disulfide	33	ND	75	28	230	99	26	10	ND	210	74	230	1,809,000	454,900	239,000	NA	NA
Chloromethane (Methyl Chloride)	ND	ND	ND	ND	13	6.3	ND	ND	ND	38	ND	38	5,277	1,392	772.2	NA	NA
Cyclohexane	110	ND	38	44	590	91	47	ND	390	80	380	590	NMD	NMD	NMD	NA	NA
1,1-Dichloroethene (1,1-Dichloroethylene)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.0	8.0	591,000	143,900	72,590	NA	NA
cis-1,2-Dichloroethene (cis-1,2-Dichloroethylene)	11	ND	ND	ND	5.6	ND	ND	ND	ND	7.9	340	340	124,200	29,200	13,950	NA	NA
trans-1,2-Dichloroethene (trans-1,2-Dichloroethylene)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	110	110	258,800	60,210	28,460	NA	NA
Ethylbenzene	7.1	ND	10	11	24	5.8	20	6.8	9.2	42	14	42	7,737	1,819	873.5	NA	NA
n-Heptane (Heptane)	160	6.7	33	28	2000 <sup>5</sup>	29	66	25	35	190	1,400	2,000	NMD	NMD	NMD	NA	NA
n-Hexane (Hexane)	240	7.3	56	57	2300 <sup>5</sup>	69	97	62	470	210	1,800	2,300	288,500	87,110	55,030	NA	NA
4-Methyl-2-pentanone (Methylisobutylketone)	ND	ND	ND	ND	ND	ND	ND	ND	35	ND	ND	35	242,800	65,450	31,590	NA	NA
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.2	8.2	3,661,000	857,200	405,700	NA	NA
Tetrachloroethene (Tetrachloroethylene)	11	ND	ND	ND	ND	ND	ND	ND	ND	6.2	ND	11	2,953	688.1	362.8	NA	NA
Toluene	20	6.8	40	36	67	35	84	20	23	120	54	120	1,217,000	294,800	147,400	NA	NA
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	13	28	ND	ND	ND	28	7,428,000	1,757,000	852,500	NA	NA
Trichloroethene (Trichloroethylene)	12	ND	ND	ND	ND	ND	ND	ND	ND	<b>15</b>	<b>100</b>	<b>100</b>	73.7	17.5	8.5	NA	NA
Trichlorofluoromethane	ND	ND	ND	ND	24	ND	ND	ND	ND	ND	ND	24	2,136,000	516,000	257,900	NA	NA
1,1,2-Trichlorotrifluoroethane (1,1,2-Trichloro-1,2,2-Trifluoroethane)	21	11	ND	ND	10	12	39	16	15	ND	24	39	101,700,000	24,040,000	11,560,000	NA	NA
1,2,4-Trimethylbenzene	ND	ND	ND	ND	8.9	ND	5.2	ND	ND	6.8	ND	8.9	25,410	5,769	2,620	NA	NA
1,3,5-Trimethylbenzene	ND	ND	ND	ND	5.9	ND	ND	ND	ND	5.2	ND	5.9	25,550	5,799	2,630	NA	NA
2,2,4-Trimethylpentane	ND	ND	ND	42	ND	ND	ND	30	490	83	ND	490	NMD	NMD	NMD	NA	NA
Vinyl chloride	8.1	ND	12	ND	5.7	ND	ND	ND	<b>710</b>	22	<b>3,600</b>	<b>3,600</b>	702.3	177.4	93.7	NA	NA
m,p-Xylene	6.5	ND	7.6	7.8	18	8.3	15	7.3	11	31	7.7	31	NMD	NMD	NMD	NA	NA
o-Xylene	6.6	ND	6.8	8.0	20	7.8	14	6.2	12	30	8.2	30	Saturation	5,159,000	2,579,000	NA	NA
<b>USEPA Method 8015B</b>																	
Methane	(%) 1.0	(%) 0.038	(%) 0.58	(%) <b>6.2</b>	(%) 0.068	(%) 1.9	(%) 1.8	(%) 0.42	(%) <b>9.3</b>	(%) 1.3	(%) 0.53	(%) <b>9.3</b>	NMD	NMD	NMD	5.0	15.0

Notes

- <sup>1</sup> Results based upon the calculation in the USEPA's Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model (<http://www.epa.gov/athens/learn2model/part->
- <sup>2</sup> Depths indicated in feet below ground surface (bgs)
- <sup>3</sup> According to the National Fire Protection Association, the LEL for methane is 5.0%, while the UEL is 15%.
- <sup>4</sup> Numbers illustrated in bold indicate concentrations equal to or above Target Soil Gas Concentrations or within the explosive range for methane.
- <sup>5</sup> As indicated by H&P Mobile Geochemistry, the concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.

Acronyms

NA: Not applicable  
ND: Not detected  
NMD: No model data for constituent  
ug/m<sup>3</sup>: micrograms per cubic meter  
USEPA: United States Environmental Protection Agency  
VOCs: Volatile organic compounds

Prepared By: KLM / 2/23/2007  
Checked By: AWB / 2/23/2007

Table 2: Summary of Soil Gas Laboratory Analytical Results from Proposed Community Center

Soil - Gas ID Soil Sample Depth <sup>2</sup>					Maximum Concentration Detected at Proposed Community Center	BACKWARD Results of Johnson & Ettinger Vapor Intrusion Model - Estimated Risk-based Soil Gas Standards <sup>1</sup>			Explosive Range	
	SB-12	SB-13	SB-14	SB-15		Protective Target Concentration (ug/m <sup>3</sup> )	Best Estimate Target Concentration (ug/m <sup>3</sup> )	Protective Target Concentration (ug/m <sup>3</sup> )	Lower Explosive Limit (LEL) <sup>3</sup> (%)	Upper Explosive Limit (UEL) <sup>3</sup> (%)
<b>USEPA Method T0-15 (VOCs)</b>										
Acetone	80	200	ND	550	550	819,400	291,800	163,100	NA	NA
Benzene	120	260 <sup>4</sup>	100	ND	260	1,557	383	192	NA	NA
2-Butanone (MEK)	25	87	5.1	ND	87	3,444,000	1,121,000	556,400	NA	NA
Carbon disulfide	88	200	28	630	630	2,642,000	654,500	349,000	NA	NA
Carbon tetrachloride	ND	ND	ND	480	480	920.7	217.7	105.6	NA	NA
Chloromethane (Methyl Chloride)	9.9	8.7	20	ND	20	8,865	2,338	1,297	NA	NA
Cyclohexane	88	37	180	11,000	11,000	NMD	NMD	NMD	NA	NA
1,2-Dichloroethane (Ethylene dichloride)	ND	ND	ND	100	100	399.6	102.1	53.69	NA	NA
1,1-Dichloroethene (1,1-Dichloroethylene)	5.1	ND	ND	770	770	862,800	217,800	106,000	NA	NA
cis-1,2-Dichloroethene (cis-1,2-Dichloroethylene)	110	19	30	22,000	22,000	181,300	42,630	20,370	NA	NA
trans-1,2-Dichloroethene (trans-1,2-Dichloroethylene)	28	ND	12	6,900	6,900	377,900	87,910	41,550	NA	NA
Ethylbenzene	30	560	12	4,000	4,000	13,000	3,057	1,468	NA	NA
4-Ethyltoluene	ND	25	ND	57	57	NMD	NMD	NMD	NA	NA
n-Heptane (Heptane)	250	39	120	6,800	6,800	NMD	NMD	NMD	NA	NA
n-Hexane (Hexane)	280	65	360	9,000	9,000	421,200	127,200	80,350	NA	NA
4-Methyl-2-pentanone (Methylisobutylketone)	ND	5.3	ND	87	87	354,500	95,550	46,120	NA	NA
Styrene	ND	17	ND	100	100	5,344,000	1,251,000	592,300	NA	NA
Tetrachloroethene (Tetrachloroethylene)	ND	ND	ND	84	84	4,961	1,156	549	NA	NA
Toluene	110	300	62	28,000	28,000	1,777,000	430,500	215,200	NA	NA
Trichloroethene (Trichloroethylene)	83	30	66	2,400	2,400	123.9	29.4	14.32	NA	NA
1,1,2-Trichlorotrifluoroethane (1,1,2-Trichloro-1,2,2-Trifluoroethane)	15	26	14	ND	26	148,600,000	35,100,000	17,030,000	NA	NA
1,2,4-Trimethylbenzene	8.4	57	ND	150	150	37,090	8,422	3,826	NA	NA
1,3,5-Trimethylbenzene	6.3	61	ND	200	200	37,300	8,466	3,840	NA	NA
2,2,4-Trimethylpentane	ND	ND	170	ND	170	NMD	NMD	NMD	NA	NA
Vinyl chloride	300	47	300	150,000	150,000 <sup>5</sup>	1,180	298	157.4	NA	NA
m,p-Xylene	26	290	9.0	2,700	2,700	NMD	NMD	NMD	NA	NA
o-Xylene	33	320	7.0	3,000	3,000	Saturation	7,533,000	3,766,000	NA	NA
<b>USEPA Method 8015B</b>	(%)	(%)	(%)	(%)	(%)					
Methane	2.3	0.85	5.9	6.3 <sup>6</sup>	6.3	NMD	NMD	NMD	5.0	15.0

**Notes**

<sup>1</sup> Results based upon the calculation in the USEPA's Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model ([http://www.epa.gov/athens/learn2model/part-two/onsite/JnE\\_lite\\_forward.htm](http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite_forward.htm)). As the proposed community center will be used for commercial purposes, the standard default exposure parameters in the Johnson & Ettinger Vapor Intrusion Model were changed to reflect this use. The list of parameters that were changed can be found in the USEPA Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (RAGS Volume I) dated March 25, 1991, "Summary of Standard Default Exposure Factors - Commercial/Industrial Use: Inhalation of Contaminants Exposure Pathway".

<sup>2</sup> Depths indicated in feet below ground surface (bgs).

<sup>3</sup> According to the National Fire Protection Association, the LEL for methane is 5.0%, while the UEL is 15%.

<sup>4</sup> Numbers illustrated in **bold** indicate concentrations equal to or above Target Soil Gas Concentrations or within the explosive range for methane.

<sup>5</sup> As indicated by H&P Mobile Geochemistry, the concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.

**Acronyms**

NA: Not applicable

ND: Not detected

NMD: No model data for constituent

ug/m<sup>3</sup>: micrograms per cubic meter

USEPA: United States Environmental Protection Agency

VOCs: Volatile organic compounds

Prepared By: KLM / 2/23/2007

Checked By: AWE / 2/23/2007

**Table 3: Summary of Soil Gas Laboratory Analytical Results from Proposed Community Center & OSHA PELs**

					Maximum Concentration Detected at Proposed Community Center	FORWARD Results of Johnson & Ettinger Vapor Intrusion Model - Estimated Indoor Air Concentrations <sup>1</sup>			OSHA Permissible Exposure Limits (PELs) for Air Contaminants <sup>2</sup>
Soil - Gas ID	SB-12	SB-13	SB-14	SB-15		Low Prediction	Best Estimate	High Prediction	
Soil Sample Depth <sup>2</sup>	6.0 (ug/m <sup>3</sup> )	6.0 (ug/m <sup>3</sup> )	6.0 (ug/m <sup>3</sup> )	6.0 (ug/m <sup>3</sup> )	(ug/m <sup>3</sup> )	(ug/m <sup>3</sup> )	(ug/m <sup>3</sup> )	(ug/m <sup>3</sup> )	(ug/m <sup>3</sup> )
<b>USEPA Method T0-15 (VOCs)</b>									
Acetone	80	200	ND	550	550	0.343	0.9632	1.723	2,400,000
Benzene	120	260	100	ND	260	0.08641	0.3557	0.7092	3,190
2-Butanone (MEK)	26	87	5.1	ND	87	0.03688	0.1133	0.2283	590,000
Carbon disulfide	88	200	28	630	630	0.2417	0.9694	1.845	62,200
Carbon tetrachloride	ND	ND	ND	480	480	0.1421	0.6009	1.239	62,900
Chloromethane (Methyl Chloride)	9.9	8.7	20	ND	20	0.00922	0.03497	0.06302	207,000
Cyclohexane	88	37	180	11,000	11,000	NMD	NMD	NMD	1,050,000
1,2-Dichloroethane (Ethylene dichloride)	ND	ND	ND	100	100	0.03935	0.154	0.2928	405,000
1,1-Dichloroethene (1,1-Dichloroethylene)	5.1	ND	ND	770	770	0.2606	1.07	2.121	NPEL
cis-1,2-Dichloroethene (cis-1,2-Dichloroethylene)	110	19	30	22,000	22,000	1.945	8.272	17.31	NPEL
trans-1,2-Dichloroethene (trans-1,2-Dichloroethylene)	28	ND	12	6,900	6,900	1.866	8.022	16.97	NPEL
Ethylbenzene	30	560	12	4,000	4,000	1.144	4.863	10.13	435,000
4-Ethyltoluene	ND	25	ND	57	57	NMD	NMD	NMD	NPEL
n-Heptane (Heptane)	250	39	120	6,800	6,800	NMD	NMD	NMD	2,000,000
n-Hexane (Hexane)	280	65	360	9,000	9,000	6.24	20.66	32.71	1,800,000
4-Methyl-2-pentanone (Methylisobutylketone)	ND	5.3	ND	87	87	0.02867	0.1063	0.2203	410,000
Styrene	ND	17	ND	100	100	0.02732	0.1167	0.2465	426,000
Tetrachloroethene (Tetrachloroethylene)	ND	ND	ND	84	84	0.02307	0.09902	0.2085	678,000
Toluene	110	300	62	28,000	28,000	9.021	37.99	75.99	754,000
Trichloroethene (Trichloroethylene)	83	30	66	2,400	2,400	0.72	3.034	6.231	678,000
1,1,2-Trichlorotrifluoroethane (1,1,2-Trichloro-1,2,2-Trifluoroethane)	15	26	14	ND	26	0.00769	0.03255	0.06709	760,000
1,2,4-Trimethylbenzene	8.4	57	ND	150	150	0.03513	0.1547	0.3406	NPEL
1,3,5-Trimethylbenzene	6.3	61	ND	200	200	0.04658	0.2052	0.4525	NPEL
2,2,4-Trimethylpentane	ND	ND	170	ND	170	NMD	NMD	NMD	NPEL
Vinyl chloride	300	47	300	150,000 <sup>3</sup>	150,000	59.06	223.8	442.6	2,560
m,p-Xylene	26	290	9.0	2,700	2,700	NMD	NMD	NMD	435,000
o-Xylene	33	320	7.0	3,000	3,000	0.9878	4.07	8.14200	435,000
<b>USEPA Method 8015B</b>									
Methane	(%) 2.3	(%) 0.85	(%) 5.9	(%) 6.3	(%) 6.3	NMD	NMD	NMD	NPEL

**Notes**

<sup>1</sup> Results based upon the calculation in the USEPA's Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model and the known maximum concentration detected at the proposed Community Center ([http://www.epa.gov/athens/learn2model/part-two/onsite/jnE\\_ite\\_forward.htm](http://www.epa.gov/athens/learn2model/part-two/onsite/jnE_ite_forward.htm)). As the proposed community center will be used for commercial purposes, the standard default exposure parameters in the Johnson & Ettinger Vapor Intrusion Model were changed to reflect this use. The list of parameters that were changed can be found in the USEPA Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (RAGS Volume I), dated March 25, 1991 "Summary of Standard Default Exposure Factors", Commercial/Industrial Use, Inhalation of Contaminants Exposure Pathway.

<sup>2</sup> As identified in 29 Code of Federal Regulations (CFR) Part 1910 Occupational Safety and Health Standards "Limits for Air Contaminants" Tables Z-1 and Z-2. The Permissible Exposure Limits (PELs) are 8-hr time weighted averages (TWAs).

<sup>3</sup> Depths indicated in feet below ground surface (bgs).

<sup>4</sup> According to the National Fire Protection Association, the LEL for methane is 5.0%, while the UEL is 15%.

<sup>5</sup> As indicated by H&P Mobile Geochemistry, the concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.

**Acronyms**

OSHA Occupational Health and Safety Administration

NA Not applicable

ND Not detected

NMD No model data for constituent

NPEL No PEL for constituent

ug/m<sup>3</sup> micrograms per cubic meter

USEPA United States Environmental Protection Agency

VOCs Volatile organic compounds

Prepared By KLM / 2/23/2007

Checked By AVB / 2/23/2007